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30 September 1985

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

ADVANCED MATERIALS

RECENT ADVANCES IN COMPOSITE MATERIALS REVIEWED

Paris INDUSTRIES & TECHNIQUES in French 10 Apr 85 p 18

[Article by Laurent Schwartz: "Composites: Improved Profitability"]

[Text] Shorter cycles with thermoplastic dies, stabilized thickening for SMC [not further identified], continuous production... It was one good news after the other at the European Symposium on Composites.

Promises of increased productivity through the use of thermoplastic composites, continuous production, workshops with automatic monitoring... The composites sector is looking for profitability, both at materials and at process level. It has to, especially now that light alloys have become a threat on its own market. Indeed, the weight and strength of light alloys keep improving and no materials and labor reconversions are required, contrary to what is the case with composites. Speakers at the European Symposium on Composites, which took place in March, presented technical solutions likely to reduce production costs. A legitimate concern since over 700,000 tons of composites are produced in Europe every year.

The annual rate of growth, however, is lower than was hoped a few years ago.

Akzo Plastics is developing a material based on PETP (thermoplastic polyester), which has a better heat resistance than existing materials with a polypropylene or polyamide matrix. Its assets: a simple and fast cycle (deep drawing) lasting less than 75 seconds, compared with several minutes for SMC (preimpregnated heat-setting polyester compound). For his part, Roland Ganga, of the Atochem new product development department, is proposing a new approach to heat-setting composites: that in which the material is formed from an impregnated thermoplastic fiber (ITF) sheathed by a plastic of the same type as the matrix. The resulting composite includes continuous filler fibers and can be obtained in many ways: pultrusion, filament winding, draping, single-fiber weaving. To quote Roland Ganga, the user is able to "play" with the impregnated thermoplastic fiber, as the semi-finished product retains is thermoforming and thermowelding abilities, due to its thermophastic nature.

Instant Thickening

As far as heat-setting composites are concerned, the English firm Scott Bader has been working for two years on a material thickening system for SMC (with the addition of a resin powder). The material obtained remains stable in time, contrary to traditional SMC materials thickened chemically (through addition of a metal oxide), which also require special storage conditions. According to S. Fearon, general manager of Scott Bader France, "the instant thickening obtained with the Crystic Impreg system represents as important a progress as the development of SMC itself in the 1960's." Continuous production, a factor of profitability, is obtained through process automation, which implies the use of systems to monitor product changes during fabrication. Thus, the Experimental Physics and Microwave Laboratory, in collaboration with Aerospatiale Aquitaine, has developed microwave circuits that will measure the rate of impregnation and the degree of polymerization of the resin. For the time being, Aerospatiale is asserting its automation policy through a program of composite monitoring of the flexible workshops where its composite materials are made. At present, the program covers especially "heat treatment" equipment and the preparation of resin systems.

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ADVANCED MATERIALS

EUROPEAN EFFORTS IN CERAMICS R&D DESCRIBED AS SCATTERED

Paris INDUSTRIES & TECHNIQUES in French 1 Apr 85 pp 59-65

[Article by Martine Castelle and C.G.: "Ceramics: We Shall See After 1990"]

[Excerpts] Europe: As Always, Scattered Efforts

As usual, we observe that European countries have good assets with respect to both industry and research, but their efforts are scattered, In the FRG, a 10-year FF150-million program on gas turbines for transportation equipment was supported by the BMFT (Ministry of Research) and completed in 1983. Parts made of silicon carbide and nitride, including rotors, operated at temperatures of 1350°C and showed that they could offer advantages as far as overall performance, service life and the use of various carbides are concerned. The program is being accelerated: for the period 1983-1986, over FF100 million will be spent on wide-market applications and mass-production problems, on the use of new powders, on ceramic "alloys" and fiber fillers. Programs usually receive a 40-percent subsidy and are the subject of thorough consultation between the industry, the government and universities, with goals that are perfectly identified.

In Great-Britain, the department of trade and industry has supported various initiatives in the past few years. The Rolls Royce club was created by ceramic manufacturers, research centers and users in order to define characteristics to be achieved and work apparently required for turbine blades. Nothing has leaked concerning this research, but the amounts involved are well below those spent in the FRG. Yet, an acceleration is to be expected as a result of the recent report of the materials group: a 5-year program worth 120 million pounds and 50-percent subsidized gives a large share to ceramics. As for France, it lacks definite objectives gathered into a structured program. The EEC seems to be righting the helm somewhat to face Japan and the United States.

A program is under discussion and should be finalized this year. Objective: materials for transportation equipment. In spite of all, there are already collaborations between countries. For instance, the French company Desmarquest is collaborating with the Leeds University; and a process using clays as raw materials is funded with European moneys.

A Ceramics Pole in Limoges

France has a ceramics pole in Limoges: it consists of the ENSCI (National Higher School for Industrial Ceramics), a ceramics technology transfer center (CRITT [expansion unknown]) and the University, with the LA-320 laboratory of the CNRS [National Center for Scientific Research] which, after a master's degree, awards a diploma of specialized studies (DEA) in ceramics. Both institutions are empowered to deliver diplomas of doctor-engineer. In 1984, 28 engineers graduated from the ENSCI; there should be 37 this year. They will have no trouble finding jobs. Whereas traditional ceramics (tiles, bricks, bathroom appliances) are still being used, new ceramics are in the spotlight and some students are already working in the automobile, the nuclear and the electronics sector. Right now, there is a large demand from the latter. The school is studying the production methods and properties of thermomechanical ceramics (Energy Control Plan) and electronic ceramics (Components Plan). The university also offers a master's degree in the sciences and technologies of "ceramics and sintered materials." One characteristic of the pole is that all research laboratories and curricula are especially geared to the industry. Examples: SNIAS [National Industrial Aerospace Company (Aerospatiale)] for ceramic-ceramic composites; Pechiney for titanium boride electrodes for aluminum production, or even the design of a plasma furnace for extractive metallurgy.

In theory, everything is possible, but very few active developments have already been commercialized. And France still looks like a poor relation. Apart from a few spectacular developments in the aerospace and medical sectors, ceramic components, with one exception, are never used in the French automobile industry. Mr Barrau, general manager of Demarquest Technical Ceramics, a subsidiary which Pechiney acquired from Lafarge in 1984 and which since then has been associated to Criceram, acknowledges that the only ceramic part now used for mass production is a water-pump seal. Demarquest is designing experimental parts for Renault and especially for Peugeot which is still working on its "3 liters/100 km" vehicle. Thus, a heat-flow insert is now being developed to recover calories that will be used by a turbocharger. But the Japanese will be marketing inserts already at the end of 1986. In spite of the new research organization, which is coordinated by Prof Hanu from the CNRS, and in spite of the efforts made by Ceraver, Pechiney, Thann & Mulhouse, Renault, Peugeot and SEP [European Propulsion Company], technical ceramics should not find any major applications in the French automobile sector before 1990. All the same, truck owners will be glad to learn that the first ceramics components will be designed for them.

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ADVANCED MATERIALS

FRG: NEW PLANT FOR PRODUCTION OF CARBON FIBERS

Duesseldorf EUROPA CHEMIE in German 24 Apr 85 p 188

[Text] "Sigri, Inc." in Meitingen placed a new facility on line in April for the production of carbon fibers. With that, they further expanded their line of fiber products. The firm has been working with high-strength carbon fibers of various derivations and finishing them into fabric, prepregs, and carbon-fiber reinforced carbon (CFC). These products are used when high durability is required along with light weight, for example, with sporting equipment and aircraft.

Sigri decided it was necessary to get into its own production of carbon fibers. The reason is the rapidly expanding market: Sigri estimates the European market growth at 25 percent annually, including new areas of application, such as machinery construction, where small, rapidly moving parts could be replaced.

The new facility has an annual production capacity of 110 tons, which is earmarked for export as well as domestic use. Synthetic fibers made of European-produced polyacrylnitrile will be used as the raw material. Noteworthy of the new process is that, unlike most of the foreign-run facilities, multi-filament cables will be carbonized in Meitingen. This procedure promises a particularly economic production of the fibers, which are still expensive today. This is because the ovens are more completely used with the multi-filament cables, and these cables are also less expensive to purchase. Prices for carbon fibers range from 40 to 80 DM/lb, whereby Sigri is at the bottom end of the range because of this economical procedure.

With the beginning of carbon fiber production, Sigri is expanding its product line with another item with many possible applications in the future. This line was already enlarged in the last few years with graphite foil and non-woven material made from graphite. To make the changes in their business structure more apparent to the outside, just last February the company name was shortened from "Sigri Elektrographit, Inc." to "Sigri, Inc". Still, electrographite remains the main sales-earner and the most important area of activity for the Sigri Group (1984 sales: DM 1.2 billion), which is among the world's largest producers of electrographite.

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AUTOMOBILE INDUSTRY

NEW MATERIALS TO LIGHTEN VEHICLES

Turin INGEGNERIA AUTOMOTORISTICA in Italian Mar 85 pp 137-141

[Paper by M. Castagna, FIAT Research Center, Orbassano-Torino, titled "Theme [Subhead] IV/4: New Materials to Lighten Vehicles," presented at 1st Informative Seminar on Subproject "Road Transportation," held in Turin on 15-16 November 1984, under CNR [National Research Center]-funded "Transportation Research Project"]

[Text] 1. Introduction

Research done under "Theme [IV]4: New Materials to Lighten Vehicles" began with a study of a vast spectrum of materials, in part already widely known and being used outside the automotive vehicle industry, and in part relatively new. The activities planned in connection with the lines of research stipulated in the multi-year plan are summarized in Table I, which also indicates the entities that participated in the program.

To evaluate the importance of proceeding with weight-reduction work on the various components and subsystems of a vehicle, in terms of the economic balance between expected economies in fuel consumption and possible incremental production costs, a critical analysis was made of the data available in the technical literature, and criteria were identified for substitution of the materials. This study, which took into consideration, in addition to economic-type parameters, also those parameters connected with manufacturing technologies and with design requirements, in accordance with the methodology diagrammed in Table II, provided indications as to the potential advantages and limits of weight reduction to be achieved through the use of high-tensile steels, aluminum alloys, plastic materials including fiber-reinforced ones, and plastic-and-metal laminates, with steel as well as with aluminum skins.

During the first year of activity, a study was also made of the status of applications and of the developmental prospects of magnesium alloys in vehicles; however, for reasons of priorities, it was found necessary to discontinue the study and development of applications of these alloys. Instead, activity was concentrated on a few classes of materials (high-tensile

steels, plastic-and-metal laminates, and aluminum alloys), and in particular on problems relative to those properties and characteristics of their use in respect to which knowledge was found to be most lacking.

2. High-Tensile Steels

Although high-tensile steels have been in use for several years now in flat products in the automotive vehicle industry for limited applications, especially in Japan and the United States, many of their technological aspects have yet to be more clearly understood before their use can be further generalized and optimized, to the extent, that is, of being able to make full use of the advantages potentially obtainable from the higher yield strength of these materials.

Work along this line was concentrated on two of the most important problems that, directly or indirectly, restrict wider use of high-tensile steels in the automotive vehicle industry. These are:

--Their behavior with respect to corrosion, particularly in the presence of repeated mechanical stresses;

--Their characteristics with respect to stamping.

2.1 Behavior With Respect to Corrosion

As regards the first of these two problem areas, substantial differences of behavior with respect to corrosion, as between hightensile and mild steels, were found not to exist, either in accelerated laboratory tests or in tests of natural exposure in various climatic zones. It was also confirmed that the state of the surface, and in particular the presence therein of pollutional elements and compounds derived from the manufacturing and lamination processes, such as carbon and oxides, is responsible for significant deterioration of behavior with respect to corrosion.

This makes it clear that the problem of characterization of the basic steel and of its surface state is of fundamental importance for ensuring a satisfactory behavior of painted components with respect to corrosion.

Various types of protective coatings were characterized (electrolytic zinc-plating, galvanized zinc-plating, Zincroxid and Zincrometal) to determine the thicknesses and sequences of individual layers and their basic chemical composition, evaluating also their degree of porosity. Characterization was extended in particular to zones subjected to resistance welding, so as to determine the damage suffered by protective coatings as a result of that process. Findings confirmed the virtually total disappearance of pre-coating in the welded zone, associated with local formation of residual tensile stresses of magnitudes ranging to significant values.

To evaluate the influence of an aggressive environment, of the type derived from the direct action of common rock salt on a component, corrosion-fatigue tests were run on spot welded joints in FEE P 275 steel. The aggressive environment consisted of an aqueous solution of sodium chloride in variable concentration between 0.5 and 2 percent, and the frequencies of stress cycles ranged between 5 and 25 Hz.

The results obtained to date indicate a substantial reduction of fatigue life of the joints compared with analogous tests made in air, and it was therefore planned to continue the testing, extending it also to lower test frequencies, in a range in which the aggressive effect of the environment is presumed to be greater.

2.2 Characteristics with Respect to Stamping

To study the plastic deformation phenomena that occur during stamping of high-tensile steel sheet, a simulative crosshatch stamping die was designed and built, to be used on a hydraulic press with programmable electronic control, available at the CRF.

To define and characterize the types and magnitudes of the deformations obtainable with this die, an analysis was made of the deformation trajectories and states of deformation in the crosshatch stampings, having previously marked out grids, consisting of a succession of small circles, on the blank sheets prior to stamping.

Using this technique with a grid made up of 5-mm-diameter circles, local deformation distributions were analyzed on deep-drawn crosshatchings of various depths stamped in high-tensile steel sheets of various kinds as compared with mild steel stampings in mild steel sheets. A systematic testing program was thus initiated, aimed at determining the effect of various important parameters--such as the geometry and size of the starting sheet-steel blank, the load of the blank holder, the type of stamping lubricant, and the characteristics of the material--on the trajectories and final states of deformation, as well as on the limiting stamping depth.

The different behaviors of several types of high-tensile steels as compared with that of FEP04 deep-drawing mild steel, under "dry-stamping" conditions, that is, treated only with protective oil, are shown in Fig 1: The size of the blank sheet is plotted along the X-axis, and the maximum depth of stamping along the Y-axis.

These curves bear out the sharply discriminant capability of the methodology insofar as concerns suitability to stamping of the different materials. They show, among other things, that the stamping depth diminishes with increased size of the starting sheet-steel blank. The conclusion may be drawn that the simulative crosshatch stamping die can be particularly useful in the selection of the various classes of stamping-type sheet metals, using as a discriminant parameter in the first approximation the critical stamping depth (at rupture), which is the easiest parameter to measure.

The methodology of fixed-parameter testing has been defined in its essential lines. Practical testing need only be extended now to various combinations of the process parameters (blank-holder load, lubricant, stamping speed, sheet thickness, etc).

In conclusion, since the crosshatch stamping die cannot simulate all the situations encountered in practice in the stamping of vehicle body components, it will be necessary to define other types of simulational dies to supplement the crosshatch die for particular simulations.

3. Plastic-and-Metal Laminates

Plastic-and-metal laminates are sheet-materials consisting of external steel or aluminum faces or "skins" enclosing, sandwich-style, a core of polymeric material (for example, polypropylene, polyethylene or polyamide).

A study was made of these materials to obtain the most complete possible description of their properties and performance characteristics with respect to applications in which the principal requisite is stiffness. Table III summarizes the types of material taken into consideration.

The automotive vehicle industry's interest in the use of sandwich-laminate panels, as substitutes for sheet steel for the purpose of lightening body components, is motivated not only by the advantage to be derived from their high ratio of bending-stress resistance per unit weight, but also by their suitability to stamping using existing production facilities, by their suitability to painting, even though stages in the process must be adapted to the presence of the plastic inner layer, and by the sound-deadening qualities and thermal insulation properties these materials can offer.

Experimentally and to begin with, tests were run on the characteristics most specific to panelling applications, such as stiffness: Determinations were made of elastic moduli under bending stress, as a function of temperature.

Then, a test setup was developed to determine the resistance to localized denting by the hammering action of weights striking the rigidly supported sheets.

With regard to physicomechanical characteristics as a function of the environment, determinations were made of the strength of the face-material bonding to the core, with T-type peel tests on samples subjected to various temperatures and times, and after accelerated aging in humidistat-controlled test cells, saline fog and thermal cycles.

The stamping characteristics of various plastic-and-metal sandwich laminates were defined by means of laboratory tests as well as hydraulic- and mechanical-press stampings of details, and their behavior compared with that of aluminum sheet and mild steel sheet.

A detailed evaluation was made of the mechanical behavior of several types of joints compatible with the characteristics of these materials, essentially riveted and bolted joints and adhesive bonds.

And, in collaboration with the activity under Line [Theme Subhead] 6/a: "Study of the Sources of Noise in Internal Combustion Engines," a number of prototypes of timing-system belt guards (Fig 2) were made, for evaluation of the sound-absorbing characteristics of plastic-and-metal laminates. The results obtained in this regard were especially positive (acoustic emission reduction of 2.5 dB(A) as compared with sheet-metal guards).

4. Aluminum Alloys

Research on aluminum alloys has been centered mainly on the following objectives:

--Definition of the mechanical behavior at high temperatures of casting alloys for engine components;

--Optimization of the resistance welding process with respect to lightweight alloy sheets;

--Mechanical and technological characterization of forging alloys for structural components.

4.1 Mechanical Behavior at High Temperatures

In regard to the first of these objectives, characterization of the virgin alloy G-AS9C1 was developed and completed, determining the parameters that characterize its mechanical behavior under tensile stress within the temperature interval between 20 and 300°C.

Statistical analysis of the test data yielded the parameters of the constituent relations that describe the behavior of the deformation as a function of the applied stress. These data are particularly useful, in that they constitute the necessary computer code inputs for forecasting the heat fatigue life of the engine's critical parts.

To determine, for the same alloy, the combined effect of oligocyclic fatigue and prolonged subjection to high-temperature stress on the life of the material, tests were run at two different rates of deformation at the maximum temperature of 240°C. It was thus possible to quantize the effect of metallurgical instability at high-temperatures on the fatigue strength of alloys of this type.

This effect, associated essentially with growth of the Al-Cu (θ) phase and with spheroidization of the silicon particles of the eutectic, produces a progressive softening of the material, enhancing its fatigue-strength characteristics under oligocyclic conditions, hence amply compensating the deleterious effect of creep at high temperatures.

Also characterized were some recast casting alloys with variable silicon and copper contents: G-AS5C1, G-AS5C3, G-AS9C1 and G-AS9C3. Tensile properties were determined at ambient as well as 240° temperatures, correlating them with content of alloy components. Findings showed a greater dispersion of mechanical characteristics as compared with virgin alloys.

Oligocyclic fatigue tests at 240°, at high deformation rate, were run on all four alloys. As to cyclic behavior, in general a softening was noted, except in the case of alloy G-AS9C1. As to fatigue strength, on the other hand, the materials, including virgin alloy G-AS9C1, fall into a very narrow range.

4.2 Resistance Welding

An investigation was made of the factors that influence the characteristics and quality of spot welds in aluminum alloys, using Series-5000 and -6000 sheets. The study was centered principally on:

--The influence of the sheet metal's surface characteristics, particularly the composition and thicknesses of harmful oxide layers, as determined by ESCA [X-ray photoelectron spectroscopy] and Auger [electron spectroscopy] analyses;

--Verification of the effectiveness of specific pre-welding treatments, mechanical as well as chemical types;

--Definition of optimal geometry and materials, and coatings, for electrodes, from the standpoint of obtaining adequate duration of the weld and good qualitative characteristics of the weld;

--Definition of the optimal welding parameters for fixed welding plants. In this regard, the "combined cycle" was found advisable, consisting of a suitably selected and modulated current (approximately 30 kA) and a double welding cycle.

4.3 Mechanical and Technological Characterization

As regards investigation of the correlations among manufacturing process, structure and mechanical properties, for forging alloys, Alluminio Italia undertook the design, construction and qualification of 13-inch composited aluminum-alloy wheels for automotive vehicles, with rims made of roll-formed and welded laminates, and cold-pressed wheel-hubs. Assemblage of rim and disk was done by means of welding (Fig 3). The wheel thus obtained weighs approximately 50 percent less than the traditional steel product.

A study was then made on the substitution of extruded tubing in place of roll-formed laminate for the rim, involving a determination of the most suitable tubing cross-section, through structural analyses using the finite-element method. After characterization of the tubing, it was subjected to industrial shaping tests.

Concurrently, studies were made of materials for the wheel hub (casting as well as wrought aluminum alloys), the most suitable techniques for forming and manufacturing the component, and methods of assemblage.

At the CRF, studies were made of the properties of several forging alloys (AA2618, AA2014, AA7012), selected for a feasibility study of a typical component (connecting rod), subjected, in the lightweight alloy version, to combined creep and fatigue stresses under actual operating conditions. (Fig 4 [not included] shows an actual connecting rod made of AA2618 aluminum alloy).

This study was developed through a series of phases articulated as follows:

--Analysis of the stresses predicted using a finite-element-method computer program based on a preliminary initial design and assumed load conditions;

--Determination of the mechanical properties significant to the characteristic mission of the connecting rod as a component, for the above-mentioned traditional type of alloys, as compared with innovative alloys produced by the "fast solidification" process. This process yields a finer structure than that of conventional alloys and enables the maintaining in solid solution of structure-strengthening elements such as Cu, Fe, Ni and Mg;

--Fabrication at the prototype level of a number of connecting rods using conventional alloy AA2618 for testing in a 4-cylinder assembly-line engine, to also ascertain on a preliminary basis any potential advantages in terms of emitted-noise reduction. These tests, made within the scope of Line 6/a activity, yielded encouraging results.

Testing at the level of mechanical characteristics indicated alloy AA2618 as being the most suitable for the application being investigated. In fact, based on analysis of deformations as a function of cumulative creep-test time at high temperatures, this alloy exhibited the best behavior in relation to all the conditions of stress and temperature examined.

5. Conclusions

The purpose of this report, which is necessarily synopsized and comprised of a limited number of applicative cases among those actually examined under the present project, has been to show the decisive contribution materials engineering is in a position to make to the designing of innovative components.

The work done thus far, intentionally centered on a few classes of future-usable rather than futuristic materials in the automotive vehicle industry, has made it possible to constitute and integrate a substantial data base on the properties of these materials and their behavior under conditions that are representative of those actually encounterable in service.

Some applications to the development of innovative components, particularly in the field of aluminum alloys, have already been delineated and evaluated

in terms of the net balance of overall advantages obtainable, versus, in some cases, the foreseeable resultant increments in direct costs.

Continuing work will center on use of the results obtained thus far as regards computing methods, for the forecasting of life and reliability of components and subsystems, which are to be subsequently constructed and tested under conditions simulative of those encountered in actual practice.

[End of text; tables, charts and photos follow]:

Table I

Summary of Activities Under Multi-Year Research Plan

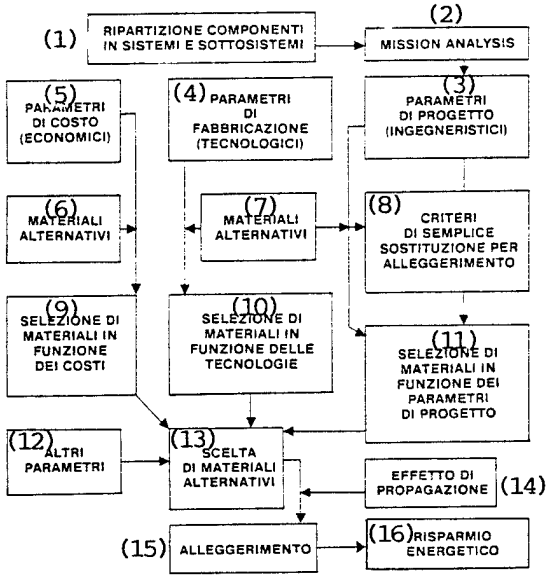
ATTIVITÁ (1)	PARTECIPANTI (2)
□ Criteri di alleggerimento(3)	□ C.R.F.
□ Acciai altoresistenziali (4)	□ C.R.F. □ C.S.M. □ Pininfarina □ I.R.S.T. □ Università Bologna □ Università Padova
□ Leghe di alluminio (5)	□ C.R.F. □ Alluminio Italia □ Pininfarina □ Università Bologna □ Università Cagliari
□ Leghe di magnesio (6)	□ C.R.F.
□ Laminati plastometallici (7)	□ C.R.F. □ Pininfarina
□ Banca dati (8)	□ C.R.F.

Key:

1. Activity.
2. Participants.
3. Weight-reduction criteria.
4. High-tensile steels.
5. Aluminum alloys.
6. Magnesium alloys.
7. Plastic-and-metal laminates.
8. Data bank.

Table II

Methodology Used in Study of Existing Data in Technical Literature



Key:

1. Distribution of Components in Systems and Subsystems.
2. Mission Analysis.
3. Design Parameters (Engineering).
4. Fabrication Parameters (Technological).
5. Cost Parameters (Economic).
6. Alternative Materials.
7. [same as 6.].
8. Substitution Criteria Based Solely on Weight Reduction.
9. Selection of Materials as Function of Costs.
10. Selection of Materials as Function of Technologies.
11. Selection of Materials as Function of Design Parameters.
12. Other Parameters.
13. Choice of Alternative Materials.
14. Effect of Propagation.
15. Weight Reduction.
16. Energy Savings.

Table 3

Materials Examined

	Composizione (1)		(2) Spessore nominale		(3) Frazione volumetrica anima %
	PELLI (4)	ANIMA (5)	(4) PELLI (mm)	(6) LAMINATO (mm)	
(7)	acciaio	HDPE*	0.20	1.5	73.5
(8)	Al	HDPE*	0.20	2.8	86
(7)	acciaio	PP	0.20	1.0	60
(7)	acciaio	PP	0.28	1.6	65
(8)	Al	PP	0.25	1.2	58.5
(7)	acciaio	PP	0.20	1.0	60
(8)	Al	LDPE	0.30	2.3	74
(8)	Al	PP	0.25	1.6	69
(8)	Al	PA 6.6	0.13	1.5	83

Key:

1. Composition.
2. Nominal Thickness.
3. Percent of Volume Representing Core.
4. Face Materials.
5. Core Materials [see Legend below].
6. Thickness of Laminate - mm.
7. Steel.
8. Aluminum.

Legend:

PE = Polyethylene.

PP = Polypropylene.

PA = Polyamide.

HDPE* = Polyethylene with cellulose fibers.

HDPE = High-density polyethylene.

LDPE = Low-density polyethylene.

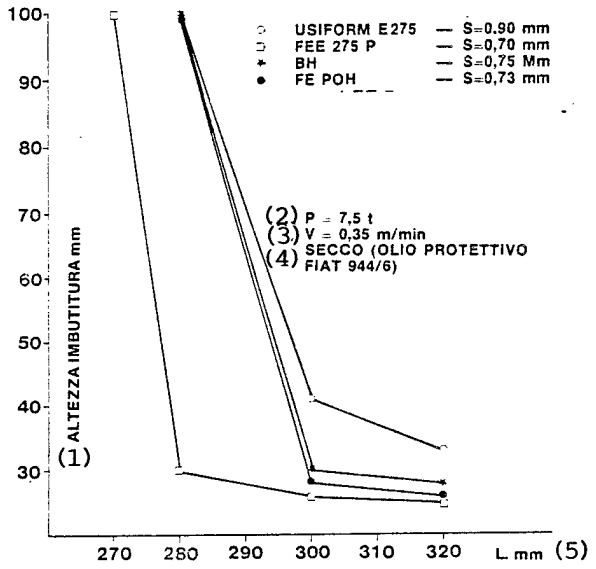


Fig 1 - Comparative behavior curves of some high-tensile steels versus deep-drawing mild steel FEP04.

Key:

1. Drawing depth - mm.
2. Pressure = 7.5 tons.
3. Rate = 0.35 meters/minute.
4. Dry (Fiat 944/6 Protective Oil).
5. Side length of square - mm.

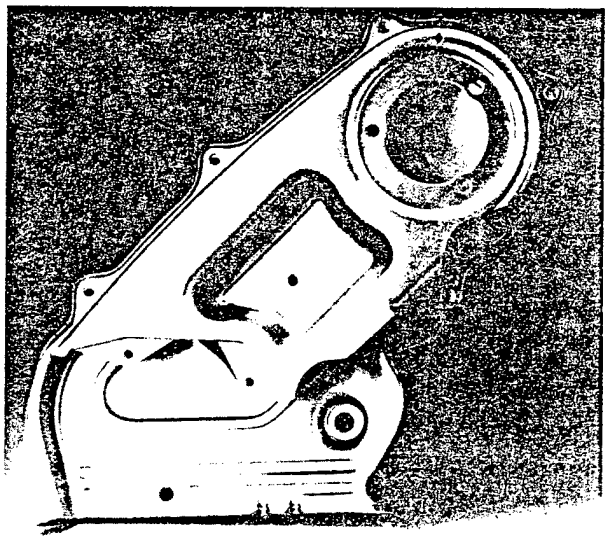


Fig 2 - Prototype of timing belt guard.

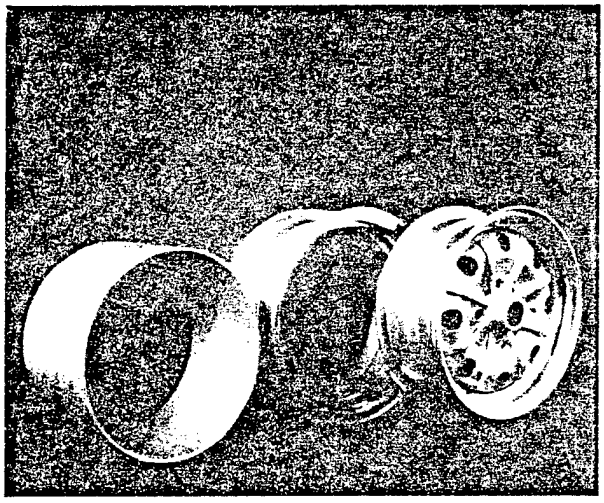


Fig 3 - Composited aluminum alloy wheel.

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AUTOMOBILE INDUSTRY

DIRECT INJECTION DIESEL MOTOR

Turin INGEGNERIA AUTOMOTORISTICA in Italian Mar 85 pp 197-201

[Paper by R. Margary, FIAT Research Center, Orbassano-Torino, titled "Theme [Subhead] IV/12/a: Direct Injection Diesel Motor," presented at 1st Informative Seminar on Subproject "Road Transportation," held in Turin on 15-16 November 1984, under CNR [National Research Center]-funded "Transportation Research Project"]

[Text] The initial objective of this line of research was to develop, on a single-cylinder basis, a combustion concept for a direct-injection automotive-vehicle Diesel motor, yielding a substantial gain in fuel economy over the precombustion chamber solution with analogous performance ratings. This was to be followed by the building of a definitive single-cylinder prototype. An evaluation was also to be made of the advantages to be derived from the application of insulation techniques to the combustion chamber in the piston.

Having successfully developed the combustion system and arrived at the point of proceeding with the definitive single-cylinder prototype, the substitute decision was made to equip a Theme 14 vehicle with a 2-cylinder Diesel motor. It was then decided (PE 83) to transfer the acquired know-how to Theme 14: "Innovative Vehicle."

For conciseness, the work done to date on the 2-cylinder motor as well will be reported under the present Line [Theme Subhead] 12/a.

Work centered initially on a single-cylinder engine with a capacity of around 400 cm^3, a typical capacity for medium-to-small sized vehicles. The first step was to design single-cylinder heads with intake ducts whose performance, in terms of swirl and discharge coefficients, could yield good combustion together with a high cylinder-fill factor.

Next, activity centered on a study of the combustion system, analyzing, on a single-cylinder motor mounted on a bhp [brake-horsepower] test stand, the effect of individual geometric and operational parameters influencing combustion, with the object of compiling data on which to base a choice offering the best compromise in terms of delivered power, fuel consumption and grade of smoke.

Research proceeded in consecutive phases as follows:

A. Fluid dynamic study of the cylinder head.

B. Study of combustion system.

C. Design and fabrication of pistons with combustion chamber made of steel and of ceramic, and initial evaluations of single-cylinder engine.

Work led to the defining of a combustion system configuration yielding performance and fuel economy characteristics in line with the starting objectives. The results were transferred to Theme 14 in the subsequent phase, designated:

D. Design and construction of the 2-cylinder Diesel engine for the innovative vehicle.

A. Fluid Dynamic Study of Cylinder Head

To begin with, a choice was made of several typical duct geometries judged to be particularly promising, either on the basis of prior tests, or on the basis of considerations of simplicity and repeatability of the shape for mass production purposes.

Plastic models of the duct types chosen and of their variants were designed and constructed for fluid dynamic tests on a steady-flow test stand. (Fig 1 shows a model of a scroll-type duct).

Experimental activity centered on the fluid dynamic characterization of the initial shapes, then on optimization of the most promising through successive modifications of geometry until satisfactory values of swirl index and discharge coefficient were obtained. The typical geometries of the ducts designed and constructed fall into the following categories:

--Deflector-valve types;

--Scroll types;

--Dip types;

--Types obtainable by means of machining operations.

The heads for the single-cylinder engine tests were designed with deflector valves for the first phase of the research, owing to the ease with which their swirl coefficient can be varied, and with scroll ducts for the configuration optimization phase, owing to their better fluid dynamic characteristics.

For the study of the flow field generated inside the cylinder by the intake system, a single-cylinder motor was provided to the Politecnico di Torino, which developed the measurement techniques for the plotting of curves by means of hot-wire anemometry, and designed a suitable test stand.

B. Study of the Combustion System

The study of the combustion system consisted of a systematic investigation of the effect of the various parameters influencing the development of the process, with regard especially to the MEP [Mean Effective Pressure], the specific consumption, and the grade of smoke throughout the operational envelope.

B.1. Definition of Injection System and Piston Cavity Position

The first phase of the research was devoted mainly to the study of the ways and means of fuel introduction, with special regard also to the interaction between sprays and combustion chamber walls.

In this phase, the following parameters were examined:

--Injection pressure: Three pump setups were tested, with maximum pressures of 380, 450 and 600 bars respectively, each with spray nozzles having optimal characteristics (number and diameter of apertures, flare angle of nozzle positioning cone);

--Offset of combustion chamber center with respect to injector.

Injection Pressure

Examination of the curves of injection pressure, needle movement and gas pressures inside the cylinder reveals that with the pump, which furnishes substantially higher injection pressures, significant reductions in ignition lag can be obtained, enabling the adoption of decidedly more retarded ignition advances, with notable gains in terms of roughness of combustion.

Comparisons of performance at the smoke limit show the extent to which an increase of injection pressure, besides yielding benefits in terms of maximum combustion pressure as a result of greater injection lag, also makes it possible to obtain significant increments of maximum MEP at the smoke limit, with particular accentuation of these at low speeds, where the reduced tangential speed of the air must be made up for by more complete atomization.

Asymmetry Between Injector and Piston Cavity Center

The design of the head, hence the positioning of the chosen injector, can be such as to provide complete symmetry between injector and combustion chamber (piston cavity), offsetting the center of the cavity with respect to the cylinder axis by an amount equal to the offset of the injector (solution 1B/2 of Fig 2).

This solution, while advantageous from the standpoint of the sprays-air distribution, nevertheless requires increased asymmetry of the "squish" area with respect to the cylinder axis, which could produce a deterioration of the air flow at the end of compression.

To evaluate the relative influence of the two parameters--asymmetry of the injector with respect to the combustion chamber center, and "squish" area asymmetry--the two variants 1/B2 and 1/B3 were designed and built; the injector offset was greater in the latter than in basic solution 1/B1.

Both the variants examined exhibited worsened efficiency and grade of smoke, practically throughout the operational envelope.

As between the two parameters involved, however, injector asymmetry with respect to the piston cavity center was found to be more critical than asymmetry of "squish" area.

B.2. Optimization of Swirl Index, Combustion Chamber Configuration, Compression Ratio.

In the second phase, the influence of the following parameters was examined with respect to scroll ducts:

--Swirl index (three levels: 2.6, 3, 3.5);

--Geometry of the piston combustion chamber (the quasi-cylindrical shape used in the preceding tests plus an ω-shaped one);

--Compression ratio.

Swirl Index

The results obtained show that increasing the motor speed reduces the combustion chamber's swirl requirement, particularly as regards the levels of smoke, while the effect on fuel consumption is notably contained.

At speeds below 2,000 rpm, the optimal solution is found to be that of a higher swirl index (Ih = 3.5), whereas at speeds above 2,000 rpm this tendency inverts in favor of a lower swirl index (Ih = 3).

Recalling the definition of the swirl index (ratio between tangential speed of the air at the wall and the mean axial velocity of the cylinder) this demonstrates the need of a well-defined level of air tangential speed for good combustion behavior.

Combustion Chamber Geometry

To evaluate the effect of shape of the combustion chamber, a piston was designed and constructed with an "omega-shaped" chamber.

As compared with the "quasi-cylindrical" chamber, the ω-shaped chamber exhibits a deterioration of efficiency and grade of smoke throughout the introduction curve at 1,500 rpm.

At higher speeds, these differences tend to disappear. That is, the higher levels of swirl mask the effects owing to the shape of the combustion chamber.

Compression Ratio

All the preceding tests were made at a constant compression ratio $r_c = 17.8 : 1$.

The influence of compression ratio was evaluated using the best configuration of those tested at $r_c = 17.8 : 1$, varying the volume of the piston chamber by modifying the depth, without altering the other geometric parameters.

These variants are characterized by compression ratios $r_c = 16.5 : 1$ and $r_c = 19.6 : 1$, respectively.

With the higher compression ratio (19.6), efficiency and grade of smoke were found to deteriorate as compared with the $r_c = 17.8 : 1$ solution.

Reducing the compression ratio from $r_c = 17.8 : 1$ to $r_c = 16.5 : 1$, a trend inversion takes place: At speeds below 2,800 rpm, the grade of smoke curve remains lower up to a certain level of introduction, above which a higher level of smoke is found with a lower r_c. This behavior can be explained by the fact that as the compression ratio drops the density of air in the process of being injected diminishes, resulting in increased penetration of the fuel sprays, which, if excessive, can cause fuel-deposition phenomena on the walls of the chamber, to the detriment of the mix and of atomization of the sprays.

B.3. Optimized Configuration

Based on the test data compiled, a configuration was defined representing the best compromise between high values of MEP and low values of specific consumption and grade of smoke.

The dimensioned mapping of MEP/rpm for the single-cylinder engine in the optimized configuration is shown in Fig 3.

The performance levels found, however, are not directly interpretable in terms of satisfactoriness of the results obtained, in that they obviously suffer from the particularly high organic losses inherent in single-cylinder engines derived from multi-cylinder engines, as in our case.

Fig 4 shows the dimensioned mapping of fuel consumption for a 4-cylinder engine, arrived at by computation, purging the performance findings related

to the single-cylinder engine of their organic losses and substituting the losses inherent in a 4-cylinder engine of the same total cylinder capacity.

The fuel-efficiency advantages, as compared with a precombustion-chamber type of engine, offer the prospect of an in-service fuel-economy gain of the order of 15 percent.

C. Construction and Testing of Pistons With Ceramic and Metallic Chambers

To evaluate the effect on the combustion process of using thermal insulation techniques in the piston combustion chamber, the two types of piston indicated in Fig 5 were constructed:

--With steel chamber fastened to the aluminum barrel by means of four lag screws passing alongside the piston pin;

--With chamber made of silicon nitride and fastened by means of an aluminum locking ring bolted to the body of the piston, and a Belleville washer made of Nimocast.

The Motors Institute of the CNR ran a number of comparative tests between these pistons and the original aluminum one, on a single-cylinder engine similar to the one used in the previous phases.

Fig 6 shows that the piston with steel chamber yields IMP's [Indicated Mean Pressure(s)] practically equal to those obtainable with aluminum chambers, with significant advantages from the standpoint of grade of smoke. The piston with ceramic chamber yields lower PMI's, with grade of smoke intermediate between the other two.

The steel-chamber solution offers further advantages over the aluminum solution, in terms of lesser maximum variations of pressure $dp/d\theta$, which are indicative of roughness of combustion (together with lesser ignition delays), and in terms of lesser ratios of peak pressure during the cycle to MEP.

D. Design and Construction of 2-Cylinder Diesel Motor for Research Vehicle

The knowledge gained under Line IV/12/a, with particular regard to intake ducts, injection system and combustion chamber, was used in the designing of the 2-cylinder, direct-injection Diesel motor to be used for the research vehicle being studied under Theme 14.

The general architecture of the motor, a supercharged version of which is also to be studied, is the same as that of the 2-cylinder gasoline engine developed under Line IV/12/b, particularly insofar as concerns the balancing system. Principal differences are: Adoption of cast-iron cycylinder liners wet-inserted in the die-cast aluminum block, instead of integral liners and strengthening of front and rear flashes of the block to support the higher

mechanical and thermal loads; and an increase of cylinder capacity from 574 cm^3 to 707 cm^3, by increasing the length of stroke from 65 mm to 80 mm (75 mm honed) to yield performance ratings similar to the gasoline version.

The section view in Fig 7 shows the position of the injector and the scroll-type intake duct.

The design performance ratings are:

--Induction version:

- Maximum power: 16 kW (22 hp) at 4,500 rpm;

- Maximum torque: 42.2 Nm (4.3 kgm) at 2,500 rpm;

--Supercharged version:

- Maximum power: 20.5 kW (28 hp) at 4,200 rpm;

- Maximum torque: 58.8 Nm (6 kgm) at 2,000 rpm.

[End of text; illustrations follow]:

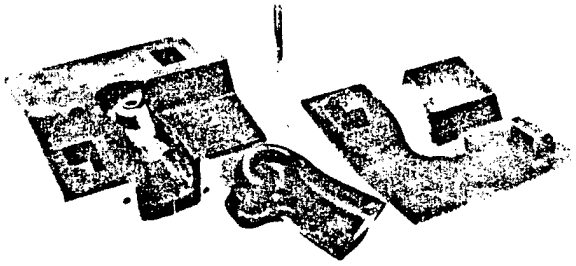


Fig 1 - Model of scroll-type duct.

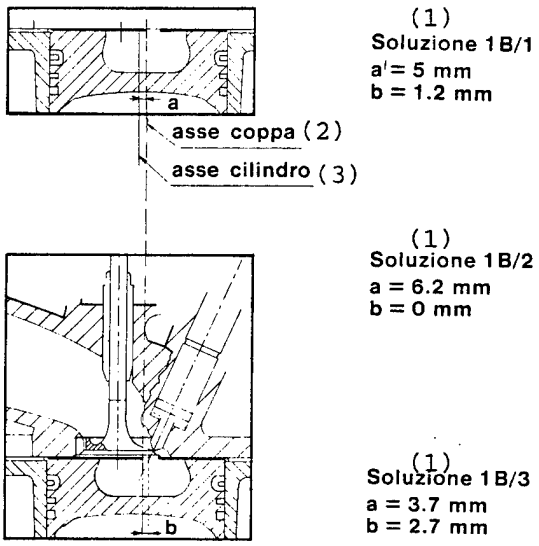
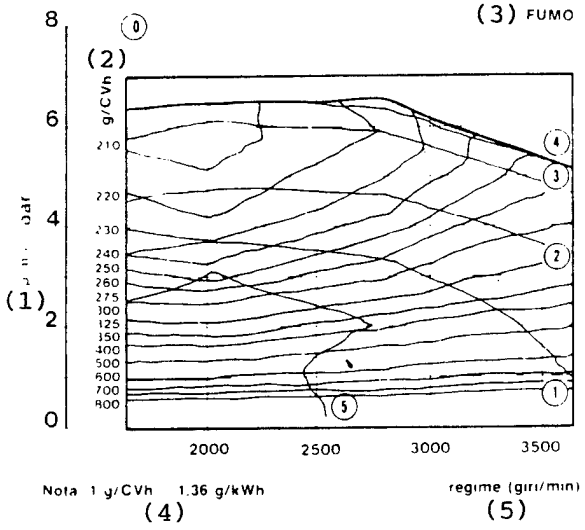


Fig 2 - Diagram of asymmetry between injector and piston cavity center.

Key:

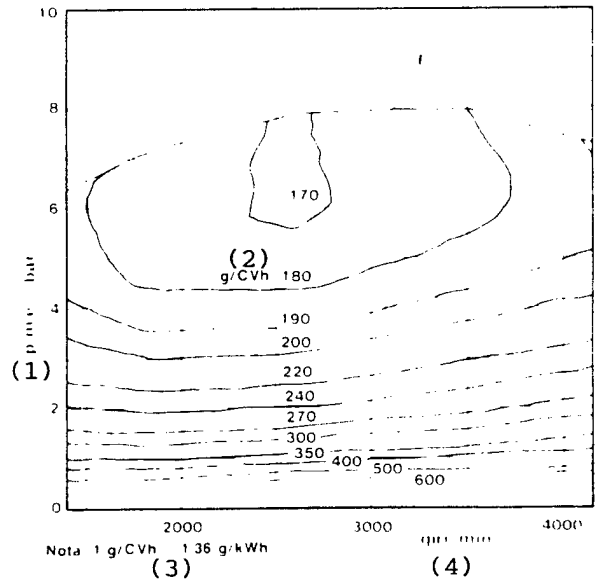
1. Solution (____).
2. Cavity axis.
3. Cylinder axis.



Key:

1. MEP (bars).
2. Grams per horsepower-hour.
3. Smoke.
4. Note: 1 gr/hp-hr
   = 1.36 gr/kW-hr.
5. Speed (rpm).

Fig 3 - Mapping of MEP/rpm for single-cylinder engine in optimized configuration.



Key:

1. MEP (bars).
2. Grams per horsepower-hour.
3. Note: 1 gr/hp-hr
   = 1.36 gr/kW-hr.
4. RPM.

Fig 4 - Mapping of fuel consumption of 4-cylinder engine.

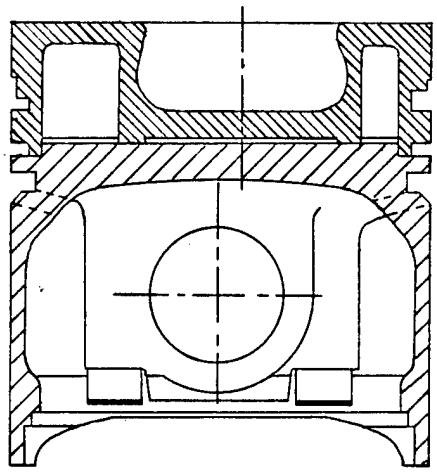


Fig 5a - Steel piston-chamber fastened with lag screws.

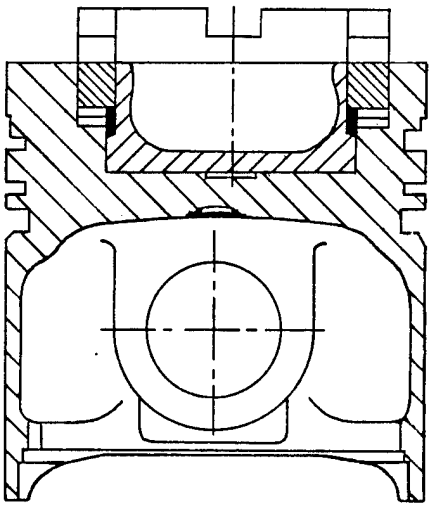
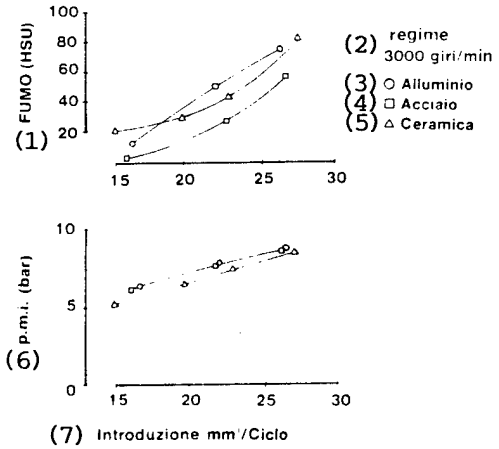


Fig 5b - Silicon nitride piston-chamber.



Key:

1. Smoke (HSU).
2. Speed: 3,000 rpm.
3. Aluminum.
4. Steel.
5. Ceramic.
6. IMP [Indicated Mean Pressure] (bars).
7. Introduction - mm^3/cycle.

Fig 6 - Smoke and indicated mean pressure curves.

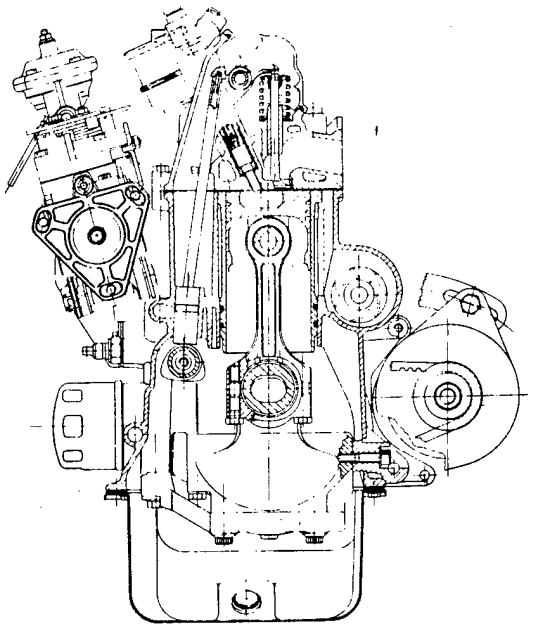


Fig 7 - Section view of 2-cylinder engine.

Activities	Participants
Fluid dynamic study of cylinder head	CRF Istituto Motori Napoli Politecnico Torino
Study, construction, testing of adiabatic pistons	CRF Istituto Motori Napoli
Definitive definition of configuration/ Prototype construction, tests	CRF Istituto Motori Napoli Politecnico Torino
Fluid dynamic study of cylinder interior	Politecnico Torino

Fig 8 - Research activities and participants.

9399
CSO: 3698/661

BIOTECHNOLOGY

BACTERIA PRODUCE 'BIOPOL' POLYESTER AT UK'S ICI

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
25 Jul 85 p 7

[Article: "Bacteria Produce Synthetics. With Sugar as Nutrient Solution. Biodegradable."]

[Text] "Biopol" is a synthetic material which has been produced by bacteria. However, the bacteria must be grown on carbohydrates, like sucrose or starch. "Biopol" is biodegradable in the human body and soil without inflicting any kind of damage. "Biopol", or poly-beta-hydroxybutyric acid, is a thermoplastic polyester which has been produced by a bacterial fermentation process. A single-cell protein body is involved.

ICI, Imperial Chemical Industries, one of the largest chemical companies in the world and the largest national concern in Great Britain and Northern Ireland, Has performed pioneering work for the past 14 years on the subject of biotechnology using single-cell organisms. As a result, "Biopol" was discovered. At first it was considered a laboratory curiosity, because its production from carbohydrates was considered too expensive for industries within the Common Market due to the high prices for those carbohydrates in particular (used in the fermentation process). Thus, the production level for this material remained at a relatively low level, strictly for surgical uses. In the meantime, Marlborough Biopolymers obtained the license from ICI and produced this material in Brazil, the Caribbean, and Southeast Asia, areas of sugar cane production, because sugar prices on the world market are significantly lower than those in the Common Market.

"Biopol," injection moulded and strengthened with organic fillers, can be spun into thread or converted to a film with excellent properties of nondiffusibility of gases. Articles made from "Biopol" polyester are rugged and possess a good surface finish. Applications were specially developed for the "Biopol" polyester for medicinal and surgical purposes and for industrial and agricultural uses.

Polymers are compounds made from giant molecules. The polymer involved here, poly-beta-hydroxybutyric acid, is synthesized (produced) within single bacterial cells in an aqueous nutrient suspension in a fermentation vessel. The nutrient suspension consists of finely distributed nutrient solids in water. ICI is

developing a fermentation process especially for the production of the single cell proteins. Fermentation is defined as the chemical conversion of materials by bacteria and enzymes, whereby the enzyme which exists as an organic compound within the living cell, controls the metabolism of the organism.

Thereafter, a new technology was developed for the extraction and purification of "Biopol" polyester so that the product could be separated from the rest of the cell mass. Biopol, a polymer with a high molecular weight, exists in forms with varying molecular weights with a narrow distribution range. If one crystallizes melted poly-beta-butyric acid very slowly, uniform crystals are formed which can grow to a diameter of one millimeter. The parameters of crystal size must be controlled during melting and crystallization. As a result, articles made from large crystals are brittle. ICI has the controlled crystallization technique and consequently can expand on potential applications for "Biopol."

"Biopol"-Polyester is delivered by ICI as granules. With conventional processes for thermoplastics, "Biopol" can be converted into molded parts, films and filaments. It can also be obtained as a concentrated viscous solution. From this solution it is possible to cast film and spin filaments. ICI has developed a centrifugal spinning process for cotton-like materials.

The crystalline melting point of "Biopol"-Polyester is approximately 180°C. ICI scientists are conducting experiments on surgical multifilament-sutures; resorbent, synthetic bone plates and bone pegs and microcapsules for controlled chemical separations, all made from the "Biopol" polyester.

13016
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BIOTECHNOLOGY

FRG FIVE-YEAR PROGRAM TO FUND BIOLOGY, BIOTECHNOLOGY R&D

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 14 Aug 85 p 27

[Text] The Federal Government wants to further basic research and industrial development in the fields of applied biology and biotechnology, with a total of DM 1.1 billion up to 1989. In the government's opinion, German science ranks high in the international field in some areas such as horticulture, virology, and immunobiology. On the other hand, there are still weaknesses, in the judgment of an advisory commission for publicly-funded research in biotechnology. Among them are genetics technology and genetics of industrially significant microorganisms, development of biological reactors, and the practical search for natural substances.

The largest allocations of the program which was passed by the Federal Cabinet will go to institutional research. The Society for Biotechnical Research (GBF), the European Laboratory for Molecular Biology (EMBL), and the European Conference for Molecular Biology (EMBC) are to receive a total of DM 336 million. The GBF in Braunschweig-Stockheim is expected to expand as the national center of biotechnological research. As it states in the program, this society, along with the other research institutes, plays an important role in the interdisciplinary research and development programs, and in transferring scientific knowledge to practical application.

The largest increase is in so-called indirect measures. Assistance in this area is to increase from DM 2 million annually to DM 40 million. A total of DM 121 million is expected by 1989, with which product and equipment development in the biotechnological industry, perhaps in the fields of cell cultures and genetics engineering, among others, are to be supported. Research scholarships and support of new "technologically oriented" businesses also count as indirect support.

In the area of combined fields of research, biological processes technology and enzyme technology receive the largest amount of support, a total of DM 140 million by 1989. The annual budget of DM 10.6 million will be increasing fourfold. Likewise increasing fourfold will be the financial support for substitute procedures for animal testing and for research in biological safety. Almost DM 100 million are expected for these two fields in the program. Another DM 100 million are expected to be used for microbial technology and genetics engineering, and for cell culture technology.

Research in the area of plant cultivation and regenerative raw materials will receive DM 35 million of assistance. A total of DM 45 million have been planned for bioelectronics, synthetic biology, and bionics, as new fields of applied biology.

13071
CSO: 3698/0651

BIOTECHNOLOGY

EEC PROGRAM TO PROMOTE BIOTECH RESEARCH, APPLICATION

Dusseldorf EUROPA CHEMIE in German 16 Apr 85 p 168

[Text] The European Community Commision wants to close the gap between pure research and application in the field of genetic- and enzyme engineering. A broad-ranged program, which will cost about DM 197 million, has the goals of integrating work in res earch, training, infrastructure development and in the linking of the efforts of individual states into those of the (European) Community. Particular weight will be given to the transfer of technology in European agriculture and industry.

The EC Commission has already been administering a program in the field of molecular-biological technology since 1982. It is supposed to promote the use of latest developments in genetics research in European agriculture and in the agricultural foodstuffs industries.

Just two years after the program's beginning, the scientists involved were able to produce for the first time a monocotyledon which was transformed with the help of a manipulated gene, according to EC Commission reports. The financial assistance also enabled the development of new "host-vector systems", which are to be of significance in the use of nontoxic organisms in food processing.

13071
CSO: 3698/651

COMPUTERS

DELFT UNIVERSITY BUILDS PARALLEL-PROCESSOR COMPUTER

Amsterdam ELSEVIERS WEEKBLAD in Dutch 13 Jul 85 p 20

[Article by Willem Kraan]

> [Excerpts] "We beat the Americans and the Japanese with this computer." They do not suffer from false modesty. And, indeed, a unique computer appears to have been built Technical University of Delft. It will not make them rich. But a new chapter in the computer history may very well be in the process of being written.

"That is now a typical Dutch reaction," says Professor L. Dekker, engineer, when he discerns some disbelief in the eyes of the reporter. He has just claimed that a computer is being built in Delft which comes out somewhat ahead of the Japanese fifth-generation computers and the American super-computers. "Everybody believes that new developments merely come from the West or the Far East. But that is thus not true."

It is not so strange, however, that Dekker's claims are initially met with some skepticism. Japan has taken the lead in the development of computers which are smarter and more consumer-oriented than anything which the computer industry has come up with so far. These fifth-generation computers would have no difficulty anymore in speaking and understanding human language and should, moreover, be able to draw very smart conclusions from disorderly loads of information. That, of course, is nothing for a computer. The American supercomputers, which have now been on the market for a number of years, are veritable numbers processors. Their calculation speed and capacity are unknown, and everything is done to increase their capacity.

And, with his machine, Dekker has thus come out ahead of them? "If everything goes well, yes."

"Everybody tries to get as much as possible out of the computer," THE FINANCIAL TIMES wrote recently, "but nobody dares to undertake the revolution which is needed for that purpose." It is exactly that revolution at which they are working in the Netherlands. THE FINANCIAL TIMES, too, is thus looking for it in Tokyo or San Franciso rather than in Delft.

It is, of course, no art to place a number of computer chips, processors next to each other. That is a question of soldering. The big problem is the monitoring and, first and foremost, the distribution of the information over the processors.

"That problem of communication within a parallel-processor computer has not yet been solved elsewhere," says Professor Dekker. "That is why the hardware, the chips are being exploited to the limit. If you try something, you replace the one bottleneck, the calculating capacity of the chip, by the other bottleneck, the communication."

In Delft, they have now found a solution for it. "We call it the newspaper system," Professor Dekker says. "We build the machine in such a way that all information is offered to all chips at the same time, in the same way that a newspaper offers all of its information to the reader simultaneously. The reader chooses from it what he likes. And the chip in the computer does the same thing. The information that is important to the processor is selected."

The first computer to which Dekker and his team have applied the newspaper system is the Delft Parallel Processor 81. This DPP 81 is being operated in a small room of the Technical University of Delft. Demonstrations are given, showing that parallel processing is, indeed, feasible. The result is not yet big since the DPP 81 merely works with eight parallel processors. The advantages of this method, however, are not yet clearly evident. At the moment, the technical experts at Delft are working on the DPP 84, a somewhat advanced computer, which, true enough, has the same number of processors as its older brother but which incorporates a number of technical tricks which would make it a lot faster.

"We are first building three copies of the DPP 84," says Professor Dekker, pointing to a couple of empty steel boxes next to a table where chips, chips and still more chips are being soldered on a so-called print plate. One of these computers will be sent to the computer center of the Technical University of Delft, a second will be delivered to the science subdivision and a third will be exported to Czechoslovakia."

Czechoslovakia? "Yes, Czechoslovakia. After a lot of bother, we now have obtained the export permit. It will be used there to monitor sports people. All kinds of body functions may be measured and analyzed directly. Indeed, training sports people may well cost money in the East Bloc." The DPP 84 will cost approximately 200,000 guilders.

First Step

The DPP 84 is actually still only a first step toward the actual goal, the DPP 87. A computer which is built according to the same principle but which incorporates no less than thousands of processors. This computer will have to be completed in 1987, and it is from this computer that Professor Dekker expects such great things. However, before it comes to that, something will have to happen. Professor Dekker has calculated that 64 million connections

will be necessary in order for the thousand processors to communicate. Make the soldering iron permanently warm! "No, with electrical connections we shall not achieve it," says Professor Dekker, "we stake everything upon the glass fiber technology."

It is not even the soldering problem which makes the astronomical number of connections all but unattainable. Electrical connections may disturb one another, the way telephone lines will sometimes do it. With glass fiber compounds, through which light goes, this so-called cross talk presents no problems.

The big question, of course, is whether, in the meantime, in some IBM lab or other, they are not working secretly on the same principle.

"No, I do not believe so," says Dekker with a smile. "I admit that this is rather remarkable. But also IBM is stuck in the shackles of the classical digital machine."

When ready, the DPP will cost approximately 2 million guilders. "But it will then also accomplish twenty times more than a Cyber or Cray machine," says Professor Dekker. "And they also cost millions. And knowledge processing, the supercomputers certainly cannot handle that."

Patents

In answer to the question what the situation is with regard to patenting of the inventions, Professor Dekker reacts with a very tired expression on his face."Applying for a patent. That takes a lot of effort. And we have no special employee here to arrange that for us. And, alas, there would be little sense in it. Developments are so fast that a patent becomes obsolete the moment it is granted. And you cannot become rich from this computer. You can make no use of existing software, you have to develop all of it new. To be sure, that is rather simple on account of the design of the computer, but you can only become rich if you deliver the computer, including usable software."

7262
CSO: 3698/648

COMPUTERS

BRIEFS

ESPRIT PROJECTS--It has been decided that two artificial intelligence projects of the European ESPRIT program [European Strategic Program for R&D in Information Technology] would be entrusted to Framentec and several of its partners. The total investment concerning these projects, which are financed in equal proportions by manufacturers and by the European Community, amounts to over 4 million ECUs [European currency unit] (1 ECU = FF 7). The first project will take three years to complete; it is called "Knowledge representation and inference methods in industrial process control." Its goal is to design expert systems in fields where time dependence must be taken into account. Framentec's partners for this project are two major manufacturers, Krupp Atlas Electronik and British Telecommunication, and the Queen's Mary College University. The second project is called "Time dependence and modelling of knowledge-base systems for process control"; it will be carried out jointly with an Italian partner, Cise. The project covers artificial intelligence methods as applied to process control. [Text] [Paris ELECTRONIQUE INDUSTRIELLE in French 15 Apr 85 p 36] 9292

CSO: 3698/649

FACTORY AUTOMATION

ITALIAN ROBOT MANUFACTURER ENTERS SPANISH MARKET

Barcelona REVISTA DE ROBOTICA in Spanish May-Jun 85 pp 27-30

[Text] REVISTA ROBOTICA's newest section seeks to give readers the broadest possible information on what domestic manufacturers, importers and engineers are making available to those who wish to automate their factories. We were virtually forced to create this new section, which makes its second appearance in this issue, because the fact is that supply is expanding in Spain.

Five years ago, Dea was just one of the world leaders in the construction and marketing of Cartesian coordinates measuring devices. In 1985, however, the Italian firm is just as well known or better known for its Cartesian coordinates assembly robots, though it still manufacturers measuring machines. In addition, a series of other developments have taken place that warrant a talk with Pierangelo Mosca, who among other things heads up Dea Iberica.

When Pragma A 3000 was introduced in 1979, there were very few Cartesian coordinates robots working on complex assembly-line applications. Dea did not invent this robot model; in fact, the same designer who conceived Pragma was one of the creators of Olivetti's Sigma (and, of course, also one of the creators of Comau's Smart). In any event, the Italians have been the main promoters of this specialty, and Dea has been the firm that in just 5 years has managed to install by far the most such systems in a wide range of countries. It has even granted a license to manufacture the A 3000 in the United States and Japan.

Robotics is a well-developed enough technology to offer industry more applications that it is currently utilizing, but it is also young enough so that new developments such as the ones we are discussing come about rapidly. Companies involved in an activity that initially seems to have nothing to do with robotics are realizing that their experience and the technologies they have mastered are quite well suited to the construction of robots or to the development of their applications. In Dea's case, the mechanical precision and electronic capabilities of its measuring machines are the source of its new branch, which we should not forget also includes the measuring robots known as Bravo. One of Dea's options at that point would have been to remain a strict specialist in measuring devices and the robotics of complex, precision assembly. But this is when some of the aforementioned developments took place. In 1982 Dea became

part of a powerful group of Italian firms, with several important international connections, called RSE (Raggruppamento Selenia Elsag). Its activities include work in new civilian and military technologies, ranging from industrial electronics to biomedicine, telecommunications, avionics and aerospace technology, among others. But we have purposely not mentioned the division in which Dea is involved: the "automated factory." This division also includes Elsag (digital control, CAM, SFF), Italcad Selenia-Autocontrol (CAD) and Saimp (machine-tools and components for SFF). We can now readily understand why Dea has recently become involved in this line.

Pierangelo Mosca explains: "The RSE group was created to bring together companies that have the resources needed for the total automation of factories, with special emphasis on: the mechanization, transportation and circulation of materials, assembly and fitting, inspection, packaging and, of course, a computer network to tie in and monitor all processes. The plan devotes special attention to robotics, which we define as the sum total of flexible tools essential to the replacement of human labor and, therefore, to total automation."

Dea's New Array of Robots

"Our firm," Mr Mosca continues, "is in charge of the RSE group's entire robotics line and in recent months has developed an whole family of robots that it had been working on for some time and that we regard as indispensable for automating workplaces right now, though even greater sophistication will gradually be available in the future. So then, our previously narrow line has expanded in several directions, namely:

--Assembly. This line now consists of the following Pragma models: A 3000, H 5000, V 3000 and V 5000. All of them share the well-known main features of the Pragma family, but they have much broader capabilities than their forerunner. The new models can handle up to 20 kilograms and work almost twice as fast as the A 3000. These models look very much like the first one in the series, but certain mechanical innovations, plus new motors and different modular electronics, give them appreciably better performance than the original A 3000, which has also benefited from these improvements.

--Loading and unloading. A new family of cylindrical coordinates robots has been developed for such applications; for the time being, it consists of the Faber C 1000, the Faber C 3000 and the Faber C 5000. All of them can have from two controlled axes (plus a third pneumatic one) up to five, as in the case with the Scara. Our strongest argument for this line is its very favorable quality/price ratio, as the price is very attractive given its performance, especially when compared to similar robots.

--Palletization. Here we have two families of robots (the Gantry and the MFM), both of the gantry model, which can load and unload items weighing up to 120 kilograms. These modular systems can be geared to the needs of

each application, depending on size and space requirements, and have vision capability for the pickup and movement of cargo. Facilities are already operating with this kind of robot, though only with items of up to 20 kilos."

Mr Mosca had a few more details to add about the new products that Dea is putting on the market. He emphasized the advantages of the new control system, which is modular and thus enables all of the robots to be run with the same instructions but with the needed control over their individual performance as well. According to him, this affords the greatest economy of operation as well as the ability to communicate with the surroundings and even to control them when necessary.

Other Areas of Robotics

When asked whether Dea was planning to stick to the robotics applications that it has dealt in so far (measuring, assembly and now cargo handling), Pierangelo Mosca replied: "Robot builders always begin with a specific specialty or, at most, a few. Subsequent developments dictate whether they then expand in this or that direction or remain specialists. Dea has so far specialized in measuring and assembly for reasons of lead time. We have to bear in mind that we have always supplied our customers with finished, turnkey equipment, rather than just build robots, and this takes time. Nevertheless, we were already thinking about getting into other areas of robotics before we joined the RSE group. It was precisely when we made this move and when Dea was given the responsibility of developing robotics in the group that our idea became a necessity. The first fruits of our efforts are the new models I have talked about, as well as a series of agreements that we are working on with other robot manufacturers to secure the resources we need to make a sound entrance into other application areas. Before too long I hope that I can be more explicit about the exact specialties, the names of the other parties to the agreements and the sort of agreements."

The Importance of Applications Engineering

Since the market is gradually maturing and new companies devoted exclusively to application engineering are appearing (a new development in Spain, further along in other countries), robot manufacturers might eventually be able to be just that, manufacturers, or mostly so. This has not been the case so far, however, nor is it likely to be in the near future. In any event, this seems to be the opinion of the Dea Iberica manager: "Although the equipment itself is of great strategic importance in robotics, we feel that our real strength lies in the experience we have gained over these 5 years in the sector of application engineering. We have built more than 80 very complex 'turnkey' systems, for example, an engine cylinder head assembly, a complete car clutch assembly, and a steering-system oil-pump assembly. Twenty-six different pumps are being assembled in this last line. Our philosophy is still to resolve a customer's problem completely."

There have been predictions for some time now that assembly will be one of the main growth areas for robots, inasmuch as it is a known fact that 40 percent of a product's cost, on the average, stems from assembly operations. This heralded growth has not yet come about, though the supply of assembly-line robots is expanding appreciably, first with the Scaras and then the new-design robots. Although Mr Mosca has announced that Dea is on the verge of entering other areas and even though it has already built cargo handling and palletization facilities, we have to assume that assembly will remain Dea's priority area, albeit an increasingly competitive one. Is the Pragma line's range of applications narrowing? "Pragma has always been designed for very specific, delicate applications with specific items over a wide range of operations. The most important factors in these applications are the selection and the intelligence of the assembly itself. This approach will be hard to supplant for the time being. Nevertheless, the assembly field is very broad and calls for a wide range of solutions, not just the ones that have appeared recently but others yet to come as well. This is why we are marketing new assembly equipment to round out the Pragma line."

Plans for Spain

Dea Iberica has been in operation for a little over a year. Even though Mr Mosca might cite other reasons for its creation, the fact is that Dea had to do something of the sort in Spain, because proper customer service for these kinds of items cannot be provided from afar. The Dea manager confirms as much: "It is true that service was not as good as we would have liked. That reason alone would justify the creation of Dea Iberica. But that is not the only reason, of course. The most important thing is being able to supply complete, turnkey systems right here from Barcelona, with all of the advantages in direct dialogue, decision-making, assistance and supply from right here. I am not saying that we are now fully able to do this, but I can say that we will be shortly. In any event, for more than a year now we have had the manpower and equipment to undertake projects and provide technical assistance here, and we have a special workshop for building certain pieces of equipment."

Mr Mosca did not say whether Dea would or would not begin manufacturing in Spain in the more or less near future. All indications are that the possibility is being looked into but that no decision has been made. For the time being he has announced the imminent expansion of display and demonstration facilities. In any case, it is once again clear that supply is expanding particularly fast.

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FACTORY AUTOMATION

FRENCH HIGH-SPEED MACHINING EQUIPMENT USES MAGNETIC BEARINGS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 8 Aug 85 p 7

[Text] The French Information Center for Industry and Technology, Fizit, reported in Frankfurt that with the numerically-controlled machine tools by the French manufacturer Forest-Line, sections of light-metal alloys can be cut for further machining in the required shapes, two to five times faster than with conventional machine tools. The machine turns 30,000 to 45,0000 rpm instead of the previous norm of 6,000 to 9,000, and feeds 50 to 65 linear feet per minute instead of 10 fpm. In order to achieve this performance, a new machine concept was needed. So, for example, the machine shafts run in magnetic bearings. Four guides continuously check and correct the positions of the spindles in relationship to the four strong electromagnets. Since there is no mechancal contact between the bearings and the spindle, there is nothing to cause friction or vibration. This new technology not only permits very high rpm's, but also improved quality of the cut sections. The number of required machining operations decreases a corresponding amount. As the German subsidiary of the firm (Forest-Line, Albrechtstrasse 17, 6200 Wiesbaden) further notes, this method also has the advantage of guiding most of the heat resulting from the cutting operation into the shavings, and not into the piece being cut, which reduces the thermal stresses on the piece. Because of the high cutting speed, the shavings are very small, which reduces the mechanical requirements of the pieces being machined, and makes possible the production of extremely thin housings--down to 0.1 inches--or very thin corrugations (0.7 inches) with a magnitude of 12 to 16 inches.

The high performance machine from Forest-Line is equipped with an automatic machine bit changer, which is mounted on the end of the work table and approached by the machine when a tool change is necessary. The machine selects the tool which is called for by the (machine) programming, which is then measured by laser. In this manner, the digital command system automatically checks the (work) area and the diameter of the tools. The work table is vertically arranged. The shavings removal is simplified with a shavings-conveyor system built on the floor. The light tool-conveyor rides on air cushions in its tracks. They say that pieces up to 12 ft long and 4.3 ft wide can be machined.

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MICROELECTRONICS

PHILIPS HEAD ON STRATEGY TO MEET JAPANESE COMPETITION

Amsterdam DE TELEGRAAF in Dutch 13 Jul 85 p 3

[Interview with Dr Wisse Dekker, president and managing director of Philips by Jaap Kos; in Eindhoven; date not specified: "The World War between Philips and Japan"]

[Text] Exclusive interview with Philips President and Managing Director Wisse Dekker.

Provoked by Japan's attitude, Philips has now taken up the sword against what is the most powerful country in the world in the business arena. Because Japan has America and Europe in an iron economic grip, while western companies cannot get a foothold on Japanese territory. Philips's top boss, Dr Wisse Dekker, has already threatened that Philips will leave Europe if the EEC does not take tough steps. In an exclusive interview Dr Dekker tells what his goals are and how he hopes to achieve them. He is certain of one thing: Philips will not lose.

Eindhoven, Saturday--Since Dr Wisse Dekker, president and managing director of Philips appeared on the screen, the struggle has grown sharper. The light bulb manufacturer from the south of this country is carrying on a brave fight against an entire country, Japan. "But," says Dekker resolutely, "that still does not make us potential losers. I have a terrible dislike of people who say: 'But we are still here.' We simply will continue to be here. We are not potential losers."

The impression that Dekker has a terrible dislike for the Japanese is totally wrong. He counts a number of Japanese among his best friends. That does not mean, however, that the Philips president and managing director is not crusading against everything that comes from the Far East into Western Europe by illegitimate means. And it is illegitimate when people do not play the normal game, based on a dose of healthy competition. When goods are dumped, Philips's present policy is to fight back at once.

Philips is on the eve of a new battle against the Japanese. A bit less Japanese merchandise here and somewhat more Philips goods in the Empire of the Rising Sun. The strategy is ready. If everything goes according to plan, the scenario calls for Philips to win a better foothold in Japan and for the companies from that country to give up something.

"But all according to fair rules," Dr Dekker emphasizes. "If it comes to that, if it really goes that far, I do not oppose the French method. For a while they used only one small office in Poitiers to import VCR's. That slowed up business considerably. If the Japanese force us, we will have to do that too. Bring all Japanese equipment in through Medemblik. Through an office with one customs officer."

Has Mr Morita (Sony president) ever sat down at this table?

Dr Wisse Dekker laughs loudly and says: "Mr Morita has been here several times. I would like to consider him one of my best friends. Besides, Sony is one of the few companies we have been able to cooperate well with in various ways and in a number of areas. A very loyal man from a very loyal company."

You would expect Philips, given the relatively small size of Sony, to have bought a share of that company long ago. Half of the shares must be for sale?

"Sony is very expensive," says the Philips president and managing director, "even now when they are doing somewhat less well. But we would not want to own shares in Sony. That would be very unwise. We have taken great steps forward with Sony in the area of research and development. That has always taken place with complete mutual agreement. That would have been very difficult with other companies. Just for that reason alone we want to keep things as they are."

Although Philips has been active in Japan for years now, the company still has not found a way to really penetrate the channels where electronics goods are typically sold. Some Philips audio and video equipment is in the department stores to be sure, but the Japanese prefer to buy in specialized stores and not in department stores. In those channels Philips has only a minimal presence.

"That is indeed where our biggest problem lies. For that reason money has now been made available, and we are considering how to approach the matter. We will attempt to break the market open for Philips through the Marantz brand.

Philips's new attack on Japan has already started. The manager in Tokyo has been replaced, and his successor has a little list of priorities. First on the list is "acquiring an interest in a Japanese electronics company or on the other hand winning a share of the market for Philips products."

"But the road to even a modest market share in Japan is full of pitfalls. The country is working for absolute mastery in a number of sectors and certainly will not tolerate any strangers in its home market."

On the other hand, the United States and Western European markets are being flooded with gleaming Japanese goods of often fine quality, at prices that make European producers weep. Japan's supremacy has already turned the United States into a developing country in the area of consumer electronics.

"That is not so strange of course," Says Dr Dekker. "The Japanese see the U.S. market as an extension of their home market. When the American left the Japanese islands after World War II, the Japanese with the speed of light put their industrial potential into operation again on the pre-war model and even standardized according to U.S. norms."

Europe demands reciprocity from Japan, but as an economic power bloc Europe itself is still not that far. The Philips boss is not putting all his money on one horse and regularly holds a mirror up to the European leaders to show them that this part of the world must still seek many of the causes of economic weakness within itself.

On this point, however, a number of developments are occurring that look hopeful. Lord Cockfield, the European commissioner for the domestic market, has had much success with his report on European unification. With this he links consultations with the leading trading partners, naturally including the Japanese. Cockfield's white paper, Dekker notes with satisfaction, resembles Philips's approach a bit, as that was sketched out in the publication "Europe 1990--An Agenda for Action."

There is one thing that can be done, since Philips does not want to wait much longer. Dekker has already let it be known in more or less veiled terms that his company will leave Europe if in a short time an acceptable climate is not created in which industries like Philips can survive. "Since 1957, when they formulated a common market in Rome in article 2 of the EEC treaty, little has been done. We have already lost more than 25 years in that way. At some point it has to come to an end."

Anyone who thinks that the Philips president and managing director has become despondent over the onward march of Japanese electronics, which has yet to be checked, is putting a totally incorrect interpretation on his attacks. He may be leaving the board of directors next year, but he will certainly return as the chairman of the lamp bulb manufacturer's supervisory board and will in that job make even more of a public nuisance of himself in order to look after Philips's interests.

The suggestion that Japan has pushed past Philips technologically makes no impression at all on Dekker. "That is not true and will not come true either." But Pioneer, for instance, is already selling a compact disk player in Japan on which you can play not only an audio disk but also a video one. "We have that too. I have one at home. But the European and the American consumers are not just panting for that. We really have all that and even more besides, but you also have to be able to sell it. Western markets are totally different than the Japanese one."

"That too gives the Japanese company a big headstart. The Japanese will buy anything that is new and advanced. The producer can acquire the necessary experience on that market with more than 200 million consumers and then after a little while enter the market with the new product in America or Europe. But for foreign companies that Japanese market is sealed tight shut. A totally different starting position therefore."

"Nonetheless I have the fullest confidence in our chances. If Europe shortly straightens out its own affairs, we will see how strong Philips is. That company is capable of great things."

Comments on Japanese Strategy

[Article by Lambert van Beers: "This is How Japan Became the Ruler of the World in Business"]

> [Text] What is the secret of Japan's world dominance? The Japanese protect their own market with a jungle of rules, many of which are not on paper. And to outsiders they swear by free trade. Lambert van Beers reveals the Japanese strategy.

Tokyo, Saturday--A Western European diplomat had a meeting at the Trade Ministry in Japan at the beginning of this year. Without asking for it, he received an exhaustive description of the Japanese competitive strategy for exporting technologically advanced products to important world markets. When the diplomat exclaimed, "But that kind of tactics will lead to a regular trade war," he was told simply, "But, Excellency, this is a real war."

To this very day the prevailing mentality in Japan is one by which every increase in exports is a battle won, and every increase in imports is one lost. But how long much longer can the country continue to win such battles? Philips announces that it is going to fight the Japanese on their own ground, in part by taking over a Japanese company. Although there may be one, maybe two examples to the contrary, in practice each Japanese firm is an impregnable fortress, thanks to a gigantic defense apparatus of written and unwritten laws.

The same is true to an even greater degree, if that is possible, for "Japan, Inc.," where so-called import associations play a central strategic role. With advice from the Trade Ministry (MITI) as a guide, formally these associations ensure an orderly market for everything you can imagine. In reality, however, they effectively see to it that certain imports never rise above a certain "advised level." In such cases quality and price are irrelevant.

While Japanese buyers are thus bound hand and foot to "advice" and other secret codes, the country's sellers work all the more closely with their Western importers. They do not even hesitate to give active support to local consumer groups that place a high priority on free trade. For the Japanese are convinced that protectionism should really be forbidden in the world. The true principle of free trade, for which rules and procedures have been established and laid down, is totally different from the Japanese principle of free trade. There are excessively detailed stipulations, drawn up by local industry but in fact never put down on paper, not even in Japanese. The result of this is that if a foreign producer appears with a product that is just as good as it is safe but that is a bit different, then the foreign producer is always denied access to the Japanese market.

Japan is the globetrotter's paradise and the graveyard of the hopeful businessmen. Chamberlain wrote that as long ago as 1895. Optimists believe that Japan can indeed be brought to its knees with heavy pressure. Philips's pressure to streamline the European market really could help. A streamlined market can form a single front against the Japanese.

But Japan plans for everything. As soon as it comes up against serious resistance somewhere, it wins time with solutions that look like concessions. Thus it has now been announced again that the import tariffs on thousands of products will drop. But that will not be reflected in the consumer price and thus will not lead to increased sales for the foreign businessmen.

Just to be safe, Tokyo has limited the growth of chain stores. Supposedly to protect the small corner store, but in fact to keep foreigners out of that important sales outlet.

Actually this is all repetition of what we have already seen. When the Japanese telephone service was transferred to private hands, it was called a turning point. Later it turned out that foreigners could not buy NTT [Nippon Telephone and Telegraph] shares and that foreign stock brokers could not trade them. In the interest of state security!

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SCIENTIFIC AND INDUSTRIAL POLICY

DAVIGNON, TINDEMANS COMMENT ON EUREKA PROGRAM

Brussels LA LIBRE BELGIQUE in French 17 Jul 85 pp 1, 2

[Interviews with Etienne Davignon and Leo Tindemans, Minister of Foreign Relations, by Michel Theys: "Will Technological Europe Be Created in Paris?"; date and place not specified]

> [Text] Mr Tindemans is of the opinion that the French "Eureka" project must be developed within the context of the Community. Mr Davignon argues that more freedom should be left to private initiative.
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> The "conference" on technological Europe is taking place these 17-18 July in Paris, and it is attended by the 12 Community members and Austrian, Swiss, Norwegian and Swedish representatives. But Belgium has every intention of turning this "conference" into a mere "symposium": as Mr Tindemans explained, these "smaller" countries will not allow the development of the French "Eureka" initiative to take place anywhere but in the context of the Community. They have every intention of saying "no" to the intergovernment cooperation advocated by President Mitterrant.
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> For his part, Etienne Davignon, an expert on this question, is trying to bridge the gap between the two approaches.

[Question] The Europeans now seem to have agreed to recognize the need for increased cooperation in the fields of technology and industrialization. Is this new awareness to be credited to the Americans, together with the "Strategic Defense Initiative" (SDI)?

[E. D.] The trend had started before that, during the past two or three years, not as a reaction, but for purely European reasons.

The Europeans became aware that three conditions had to be met if they were to have the same chances as in the United States or Japan. The first condition was to accept politically the need to define a strategic vision and to take the consequences of the choices thus made. This evolution took place little by little. The clearest sign of this political determination was the approval of the "ESPRIT" program [European Strategic Program for R&D in Infor-

mation Technology] at a time when intra-community relations were at an all-time low: the European Council meeting in Athens had just failed; the English had not ruled out using the community agricultural policy as a hostage to increase their pressure on their partners; the Germans were demanding budget discipline... It was in this execrable political context, and at a time when negotiations on community financing had reached a deadlock that the Ten decided to allocate large additional amounts to the ESPRIT program, because they had finally been convinced that this was so important that they could not oppose it. Since then, their awareness has kept increasing.

Salami

On the other hand, the Ten had to realize that they could not keep slicing the salami without acknowledging that it was indeed a salami. In other words, that it is impossible to achieve a technological development comparable to that of the United States or Japan without checking whether or not all the elements that enable them to enjoy the situation which is now theirs also exist in our countries. Now, long before the U.S. initiative, it was an accepted idea that the Community had to play an important part in creating the environment required, the "major market", European standards, etc.

Finally, the operators, the manufacturers, had to recognize that they needed it and could not just benefit from it. For if you need something, you will have to accept taking responsibilities. This evolution, too, had taken place before the SDI took off.

Developer

It is true that the "Strategic Defense Initiative" worked as a developer since it disclosed what a large country can do when, for reasons of its own, it considers that it is essential to accelerate technological development. The United States just did again with the SDI what they had done under President Kennedy to meet the Soviet challenge, when they decided that the first man to walk on the moon would be an American.

This initiative reminded public opinion that, when Washington deems something important, it can achieve a consensus and find the necessary financial resources. But another factor also became apparent: namely that the United States did not intend this program to be anything but exclusively American, contrary to the collaboration that was established, for instance, in the space sector. For these programs, there is a distribution of tasks, responsibilities and financial consequences.

In the case of the SDI, European companies that are interested will participate in a U.S. program: they will not be expected to pay and, as a result, they will not share in the responsibilities and therefore will not benefit from any of the spin-offs. Thus, even though such a collaboration may be of interest for a number of companies or researchers, the operation can obviously not become part of a European strategic program...

[Question] But you said yourself that the Americans will find a consensus when they launch a program of such a scope as the SDI. Then, how can you prevent European companies approached by Washington from being tempted? How are you going to make the Eureka program of the "Technological Community" credible when London, for instance, refuses to allocate any public funds to them?

[Answer] Nobody's position can be considered to be final until we know how Eureka--which until now is only the expression of a need, not a program--will materialize.

Spin-Offs

Under these conditions, the SDI will obviously be of limited interest to European companies. Who will own the results of research? To what extent will a European company be allowed to use them for its own benefit when it is not the program "leader"? These are essential questions and we should therefore realize that spin-offs for European companies will naturally be limited. As a result, I do not believe at all that the SDI could limit the potential of Eureka: the contrary is more likely.

[Question] The major difference between the U.S. initiative and the European plans is that the former is a pure-research program whereas Europe, on the contrary, is trying to have pure research materialize at industrial level?

[Answer] The first difference is that the U.S. program is essentially military, and civilian only incidentally. The objective is not to find out what you can do with a laser, but to design a targeted laser around terms of reference whose goal it is to implement a defense system. Which does not mean that there will be no civilian spin-offs.

In addition, the goals of Eureka and of the Commission's proposals go beyond the mere definition of a given technology: the goal of these programs is that Europe should retain expertise of the technologies that will condition the future. It is therefore also a strategic concept, but one very different from that which prevails in the United States. In addition, these programs are not limited to space applications. And finally, they also concern the conditions under which these technologies can be developed: changes in the European market are necessary if the ground is to become as fertile as in the United States or in Japan.

[Question] Is not that just the reason that we should remain in the community context rather than considering a mere inter-government cooperation?

[Answer] Opposing the community and inter-government approaches would amount to negating the experiment carried out during the past few years. Actually, two essential factors must be present.

Objectivity

The first is that this program must have a strategic objective, i.e. priorities. What is the best context to define priorities in Europe? The Community

through its Commission, because it is more objective. It has more information at its disposal and, above all, it does not have "a white elephant to sell": it does not have any program that would have started at national level but that would be too expensive, etc. It does not have any, especially since the situation of its own instruments--the JET [Joint European Torus], Ispra...--has been thoroughly clarified with the Council.

The Commission, therefore, is rather well equipped to become the independent and disinterested authority that will define and explain priorities, what is good for Europe. All the more so as its latest experiments--ESPRIT, RACE [R&D in Advanced Communication Technology for Europe], BRITE [Basic Research on Industrial Technology for Europe]--show that it is quite competent to do so and that it has good contacts with manufacturers and scientists.

[Question] How then do you explain the reluctance of countries like France or Germany?

[Answer] Because, at the same time, they must also answer other questions. For instance, to do something, must we always be 12? This brings us back to the old problem of decision making.

Snow

Let's take an example that is not as far-fetched as it would seem. To develop an essential technology, you have to use snow. But, in several Community countries, it never snows. These countries will tell you: "We agree to this program on snow. It is a huge sacrifice for us because we do not have any snow. Therefore, to make up for it, we want a program on hail because we get quite a lot of hail in our parts." Too bad if hail does not meet any of the specifications of snow and therefore cannot be the subject of a strategic program... This is a real difficulty in Europe: I mean that some will get a compensation for something that does not require any.

[Question] Apart from this, the approach adopted by the Commission in its proposals is rather revolutionary in that it provides a possibility not to force all member states to participate. It even mentions independent "agencies" that would fit into the community context...

[Answer] This is why there should not be any quarrels among schools. All that we need is a joint decision that, on the one hand, our strategic approach and the measures that we should implement to achieve the conditions of development should be at community level and that, on the other hand, implementation should depend on what each of us will bring. Acting this way would be logical and consistent if we shift from the concept of overall community cooperation to that of implementation of specific projects that can be implemented only by those who have something to contribute in that field.

Proration

The theory of "just return" is absurd when we want to create basic conditions that will benefit all of us, but in specific cases it is legitimate that someone making a 40-percent contribution should exert a 40-percent influence. This

is what is done with Airbus and Ariane, and it works. The influence and the spin-offs must reflect the risks taken, the contribution made.

This problem will be solved progressively, when we start negotiating on material points. And we must allow the concrete domain to develop on its own, otherwise manufacturers and scientists will be excessively protected against the risks they must take. In a way, this danger is inherent to any bureaucratic system, whether national or at community level, in that by trying to be perfect it may generate an imbalance between those who take a risk and those who supervise.

In conclusion, the Community is the group best qualified to identifiy priorities. As far as implementation is concerned, considering that it cannot be financed by the Community in the immediate future and that participations will essentially be national--which is important since they will not involve just demands: there will also have to be contributions--we must agree on the simplest formula.

There should be no confusion: there is room enough for a multiplicity of procedures that will depend on the tasks that must be accomplished. If universities are interested in a project, they will have to agree among themselves; for cooperation among several manufacturers, it will be up to them to agree on a contract... Thus, there will be many interested parties and I do not see why the Community should get involved in everything. There is not need to take responsibilities when it is not indispensable.

[Question] Therefore, you do not agree with smaller countries which fear that this trend could lead to a sort of technological uncoupling between "larger" and "smaller" countries within the Community?

[Answer] Not as long as priorities are identified at community level, as long as access to a minimum of knowledge is provided through the Community's basic scientific programs. Not as long as specific problems [as published] are set up in the same spirit as the few programs that already exist.

Remuneration

Belgium is not unhappy with its participation in the European Space Agency, but the contribution it agreed to make is greater than what it would have been based on the community distribution key. As a counterpart, it also gets more out of it.

The combination of the two approaches is a guarantee. The former provides access to scientific programs and makes it possible to benefit from their spin-offs. As for the manner in which what is thus gained is to be used for future programs, considering that financing is not easy to find, no one will refuse to let a partner acquire an interest.

If the whole structure was an inter-government structure, however, there would be some danger. Not due to hostility, but quite simply because it would be very difficult to alter the compromise agreements already signed by the two

or three "larger" countries which would fear that such alterations might affect the equilibrium they had reached. This combination, therefore, should give good results. It makes sure that community action will be given priority. It also makes sure that the Community will be informed of anything that is going on, even if it has no part of the action. And all will be able to contribute as long as they have something to contribute--otherwise we would again have the system of political compensations.

Equilibrium

If some countries are reluctant to contribute to an effort that would be just a community effort, it is because they feel that the Commission can hardly reject the blame for not taking everybody's interests sufficiently into account. It was hoped that the ESPRIT project would be managed according to the principle of "just return," i.e. that the States would have had the last word. But if they had had the last word, they would have put intense pressure on the Commission's departments and, to go around the obstacles thus created, it would have been necessary to buy their agreement by creating programs diversified enough to get the green light from everybody.

Clearly, equilibrium lies between the two. The Commission is aware that its effort cannot continue unless it generates an overall added value. On the other hand, the commission itself must determine what this overall added value will be, and no blackmail can be tolerated. And if, within the scope of a strategic objective, it deems it necessary to acquire expertise in a given technology, it is too bad if the condition is met only in a single European location: it will have to be done there. The ambiguity is that some States fear that the Commission may not be able to resist pressures from a majority of countries that would not make up a majority contribution.

[Question] Will all this be clarified after the Paris meeting?

[Answer] The process will be somewhat slower, for it is a complex matter. Priorities cannot be the addition of what each of us wants: rather accurate checks will be required. Especially since we will also have to investigate the expressions of interest coming from countries that do not belong to the Community.

The outcome of the Paris meeting, therefore, should be the political confirmation of the States' determination to commit themselves. Rather than following the Commission, they would then become part of the maneuvers. That is important.

Mr Tindemans: "The Commission's Card"

[Question] Belgium is going to the Paris meeting with leaden soles, at least it is dragging its feet?

[L. T.] At the meeting of the West European Union, last April in Bonn, Belgium declared itself in favor of the creation of a "Technological Community" within the European Communities. When the French pointed out that the formula did not matter, that the operation could also be made in the form of an agency,

a club of the "Airbus" type or a Community, several of us argued that the community context should be retained. For smaller European countries, the guarantees offered by the European treaty and institutions are essential in the technological field...

[Question] Otherwise, in your opinion, the Europe of technology would become the preserve of companies from larger States?

[Answer] Maybe not, but the matter is more fundamental: if we agree that it is no longer possible to have recourse to the Community formula to expand the activities of the Community, this means that, intentionally or not and maybe without saying so, we are terminating the European structure. It means that the Community can go on vegetating but that we are looking for other formulas whenever we want to innovate, take new steps. That would be the death of European construction!

[Question] Then, how do you explain that, at the European Council meeting in Milan, France joined six other countries to demand more integration and that at the same time it defended that idea of inter-government cooperation? Are the two compatible?

[Answer] The French position remains confused. In Milan too, Belgium and other countries pleaded for a Community of technology. As a result, the Ten agreed on a formula that provides for the creation of a ministerial committee to see how the "Eureka" initiative and the Commission's proposal can be coupled. This is the point of view that Belgium will represent in Paris.

[Question] But France convened a "conference" of technological Europe, not a preliminary meeting...

[Answer] We should not forget that some countries that do not belong to the Community are also invited, and that France made contacts with them. As far as I am concerned, I cannot yet clearly discern the true intentions of the French. I do not know what is going to happen in Paris, what will be put on the table, and what part could be offered to Belgium. What is certain, is that the Belgian government intends to play the Commission's card: this is the only way for us to be sure to benefit from all the results and to make sure that "smaller" countries are not neglected or merely asked to play the part of subcontractors at European level.

[Question] Is it the right time for an institutional quarrel? Is it not essential to ensure that companies start to collaborate to meet a technological challenge that will condition the future?

[Answer] Yes, but only as long as everybody acts with good will and in a community spirit. Should we agree to be excluded from a given sector in the future without being able to protest effectively? The formula, therefore, is not a negligible matter...

9294
CSO: 3698/649

SCIENTIFIC AND INDUSTRIAL POLICY

NETHERLANDS LAUNCHES INFORMATION TECHNOLOGY PROGRAM

Rotterdam NRC HANDELSBLAD in Dutch 8 Aug 85 p 9

[Text] The most recent branch on the already comprehensive trunk of the information technology promotion plan of the Dutch authorities is called "Spin." H.P.Struch, director, graduate engineer, will this year also start programs for language technology and flexible automation.

In the terms of the Ministry of Economic Affairs, the Spin program must strongly promote strategic research in the field of information technology. In this context, the research which is at present taking place at institutes, technical colleges and universities, will now have to be coordinated and placed more in the service of the industrial sector.

The term "Spin" stands for "Promotion project team information technology research in the Netherlands." The team will remain working until 31 December 1989 and, during that period, has at its disposal 90 million guilders. It will roughly be given three tasks to perform. Strategic areas will have to be selected where Dutch researchers will have a say. In those areas, research programs will be launched. In addition, the projects will be managed through the Spin office, which will have five to six qualified employees. In addition to his work as director, Struch will remain connected with the ENR, a computer service enterprise. Finally, requested and unrequested advice in the area of information technology will be provided to the authorities.

The funds will for the most part be used for partial financing of research. According to the example of the Esprit project, which was launched last year within the framework of the EC, Spin will contribute up to 50 percent to programs, which will be provided by two or more research institutes, which may or may not be working together with enterprises. The plan is that approximately ten so-called main programs are developed, each of which will be subsidized with a maximum of 5 million guilders.

There are already three concrete plans in various stages of processing. They are very far advanced with a program for the development of language

technology, which originates in the Institute for Perception Research at Eindhoven and four university research groups. In this connection, it will be a question of converting texts into language by means of computers.

There is also a plan to promote the technology of flexible production automation. The point of departure will be the Flair program which has already been presented to the Ministry of Economic Affairs. A third area is that of artificial intelligence.

In Small Parts

Without hesitation, Struch answers in the affirmative the question whether it actually makes sense to promote information technology research in the Netherlands. He says, "The research is in small parts and minor, but some groups do, indeed, have a solid international level. It is, moreover, a question of an important and fast growing industrial sector." The knowledge will have to be developed in such a way that the industrial sector will derive advantage from it. Struch: "The information technology branch is so young, and things now go so well for most enterprises that most enterprises, also due to a shortage of experts, do not think of the future."

Struch finds that the development of a climate in which, on the one hand, more attention is paid to the future and, on the other, more cooperation develops between researchers and the industrial sector, is more important than the 90 million guilders as such. Struch does see the latter happen in the Esprit program, where he is a member of an advisory group in which representatives of the electronics industry are also represented. "You see that the industrial people have informal meetings with one another before and after the advisory group meetings."

Struch also answers in the affirmative the question whether, in addition to Esprit, which, for the most part, concentrates on comparable areas, a separate Dutch program is now needed. "You stand more strongly together when you want to achieve things internationally." And, besides, despite all European considerations, "It is always handy to have something up one's sleeve. But we do, however, seek international contact."

7262
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SCIENTIFIC AND INDUSTRIAL POLICY

SGS-ATES EXPANDS OVERSEAS

Milan ELETTRONICA OGGI in Italian Jul-Aug 85 p 14

[Text] In the first quarter of 1985 SGS-ATES, the IRI-STET company that produces semiconductors, reported sales worldwide of $168 billion, which is 17 percent above its last-quarter 1984 earnings.

It just keeps right on with its sensational expansion, thanks to a competitive strategy based on massive investments in research and development, and steadily rising in the ranks of chipmakers all over the world, unlike any other European company.

Another key element in SGS strategy is the internationalization process that has prompted the Agrate-based company to sign cooperation agreements with such giants as Japan's Toshiba, and to set up production facilities all over the world.

Recently SGS announced the opening of a new chip-producing center in Singapore: that involved investment of $50 million, which is an all-time first for the tiny Asian state: the new plant will be capable of handling the entire production and marketing cycle for the silicon hips (not just the assembly phase, as is the practice in most installations in Southeast Asia); in addition, it will be supported by a modern design center for integrated circuits.

With this latest project, SGS-ATES expects to enhance its penetration of the highly promising Asian markets, where right now it makes 18 percent of its sales. In a recent interview, the company's managing director, Pasquale Pistorio, said that only with a strategy of massive investments on one's own, like the one SGS has pursued, can the European electronics industry hope to survive amid the crisis that has gripped it and recover its vanguard positions; the policy of technological cooperation agreements with overseas companies can be helpful, according to Pistorio, only in the short run, if European companies are not to fall even further behind the United States and Japan.

6182
CSO: 3698/608

SCIENTIFIC AND INDUSTRIAL POLICY

OLIVETTI'S NET ASSETS UP 65 PERCENT

Milan ELETTRONICA OGGI in Italian Jul-Aug 85 p 22

> [Text] Parent company poured in considerable resources, and even a cursory perusal of the figures in the combined earnings of the Olivetti conglomerate for the year ending last 31 December is enough to demonstrate that Olivetti's image as an electronics power to be reckoned with in Europe is not done with mirrors.

Net profits rose by 20.6 percent over the previous year, up from 295.3 to 356 billion; sales were up by 22.5 percent; in 1983 they had topped 3,736 billion but in 1984 they hit 4,578 billion. It should be noted that the net profit figure is arrived at after 250.5 billion lire in amortizations and paying 120.1 billion lire in taxes.

Again at the group level, more than 500 billion lire were earmarked for investment, and another 230 billion set aside for research and development.

A statement issued by the parent company says that market offerings of Olivetti shares had brought in something like 3 trillion lire in capital; the group's net assets, in any case increased by 63 percent from 1,202.1 billion in 1983 to 1,958.3 billion in December 1984. At the same time, Olivetti reduced its credit indebtedness by 56 percent, down to 319.3 billion lire.

In the group's budget plan, still under study by the board of directors, is a proposal for a dividend of 275 lire on common stocks (as against last year's 240-lire yield), and of 295 lire on investment shares (as against 260).

A major contribution came from the parent company, which reported net profits of 237.2 billion lire from a sales total of 2,555.5 billion lire, more than half the billing of the conglomerate as a whole.

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SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

SELENIA'S PROFITS UP 37 PERCENT--Selenia, the Italian company that makes radar, missiles, and other electronic equipment, reported a 37-percent increase in net profits over 1984, for a total of 20.6 billion lire. Sales were up 25 percent over the previous year, to 597 billion, but while 74 percent of 1983 sales were made abroad, in 1984 foreign sales dropped to 85 percent of the total. A spokesman for Selenia (an IRI-STET company) pointed out later that new orders during 1984 totalled 90 billion lire, while expenditures on research and development topped 98 billion lire. [Text] [Milan ELETTRONICA OGGI in Italian Jul-Aug 85 p 28] 6182

CSO: 3698/608

TECHNOLOGY TRANSFER

ARTICLE DETAILS GRAY MARKET IN HIGH-TECH MILITARY EQUIPMENT

Hamburg DER SPIEGEL in German 5 Aug 85 pp 60,61,63-63

/Text/ Prince Abdullah Ibn Nassir Ibn Abd el-Asis Al Saud arrived at Hamburg's Fuhlsbuettel airport on the afternoon flight from Paris. As it behooves his rank, he was driven in a white Mercedes, license plate HH-RR 985, to the hotel Interconti on the outer Alster River, and was taken to Kiel the next morning.

Prince Abdullah took a couple of spins on the grounds of the arms manufacturing plant "Krupp MAK Machine Works GmbH," in the "Leopard 2" tank, Germany's pride and joy, which made him sick. He then indicated his special interest in light armored vehicles of the "Wiesel" /weasel/ type.

In the evening, the host gave a welcome party to the Saudi royal scion and his escorts--former Bundeswehr Gen Joachim von Schwerin and the Frankfurt lawyer Wolfgang Heiermann, German representatives of the prince, with 45 bottles of champagne, according to the final bill.

The royal trip had been organized by Peter Kluever, 39, commanding a small fleet of Rolls-Royces and the owner of the "PK Electronic" company. The effort paid off: Prince Abdullah, chief of Saudi-Arabian procurement, ordered electronic equipment from the PK company to the tune of DM 65 million following his visit in late June 1983.

The equipment, from the surveillance bug in the ashtray to the infrared laser instruments and second-generation night vision equipment, were destined for the Saudi secret service.

Much of the equipment, which Kluever and his few German competitors sell throughout the world, can be exported legally. However, because of military arms control legislation and export control statutes, a few military products can only be exported with the written approval of the Federal Office for Trade and Industry.

This does not inhibit certain electronic companies from providing everything moneyed military leaders enjoy. Radar installations? No problem. Fire control equipment? Certainly. Complete electrical equipment for tanks? Will be delivered promptly.

For example, the firms "Kranz Electronic" in Steinbach in the Taunus, together with the Hamburg company "Micro and Security Electronic," are offering the ISA 2000 system. It consists of day-and-night sighting systems, cameras, laser range-finders, ballistic computers and a video screen, which is said to "increase the battle capability of tanks during day and night" (text of prospectus).

Such electronics, in particular, are more in demand in many countries than the famous Leopard 2. "Why should a country like Syria," says an insider, "spend DM 10 million for a Leo?" It is much cheaper to buy used T 72's from the Russians for about DM 350,000 each. They then are being equipped, as it happened with 300 Soviet tanks in Syria, with the most modern electronic equipment and with air cooled engines from Germany. The expert continues: "These things are then practically as new and cost the Syrians only DM 1 million each. These countries have also learned long ago how to count their pennies."

The trade is flourishing. Officially the West German exporters offer primarily protection against espionage or terrorists. Especially after plane hijackings, new orders come in large quantities.

The military equipment business is even more profitable: Here, often several hundred percent of the purchase price is added. There is not much demand for rifles, tanks and guns, which can be purchased all over the world more or less legally. The West Germans are offering the very special accessories that turn many weapons into infallible "killer machines:" targeting is more precise, and the enemy cannot take advantage of camouflage or darkness.

Unlike simple bugs, the highly sophisticated equipment is not manufactured by the security dealers themselves, but purchased from the giants in the field. It is all listed in the catalogs of the West-German electronics distributors: from Siemens to Philips, from AEG-Telefunken to Zeiss.

"Enclosed please find our offer for 100 pieces of binocular night-vision field-glasses for naval use, type PK 1200," wrote in July 1983 the PK Electronic to the Electronic Equipment Marketing Company, the Saudi purchasing agency in Riad. "This is standard equipment of the German Bundeswehr and NATO." The price, including shipping and insurance, was to be DM 30,000 each.

A few days before, PK, which likes to call itself "the largest producer in the world of secret electronics," received a teletype message from Bremen. In it, "Elektro Spezial," the Philips subsidiary, offered the night-vision glass UA 1242 for DM 20,380 each. The telex did, however, contain a "special notice." "We point out," noted the company, "that shipments abroad require an export license."

The DM 3 million deal with PK Electronic, which only changed the name plates on the glasses, was concluded despite the excessive price. The Hamburg company did not attempt to obtain the annoying export license: It shipped the items, innocently declared as "field glasses," via air freight to the Saudi Arabian capital. Everybody was happy: the Philips subsidiary had sold its goods, the PK got its commission, and the Saudis had received the glasses they wanted.

In order to facilitate this pleasant business without further interference, Elektro Speical and PK, on 14 July 1983, signed a "distribution contract" for the Arabian area, excepting the Oman emirate. A key phrase: "in addition, both parties are planning to increase their future collaboration in the field of military electronic applications, among other things, in improving existing equipment and in developing new concepts, using modern technology."

The Philips managers, who discreetly describe their activities as "manufacturing and distribution of specialized electronic applications," gave PK boss Kluever "sole distribution rights in the contract area" for 5 years. In return, PK obligated itself not to distribute or produce any products which compete directly or indirectly with the contract items." And, of course, complete secrecy: "No partner to the agreement must pass on to third persons any knowledge or information involving this agreement without prior written consent of the other party."

On the advertising pamphlets and the equipment, the Philips trademark is replaced by Kluever's "PK" emblem. The electronics exporter feels so sure of himself, that he takes over design and content of product descriptions without any changes.

Kluever is not the only one with whom the Bremen Philips managers collaborate. The ISA 2000 tank system, which is being offered by Kranz and Micro Electronic, is also a Philips product, and is even offered by the Bremen people under the same type designation.

Micro boss Joachim Creutzmann, 48, who resides in a villa bristling with alarm equipment, in the "Schoene Aussicht" area on the outer Alster river, includes still other equipment in his offerings. An example is the BM 8042, a second generation infrared fire-control device, which can be used with automatic weapons or as anti-tank weapon at night.

In addition, he is offering the thermal imager TRM 7401 which will transform night into day in tanks, naval ships and helicopters. Complete surveillance vehicles are available, just as are portable radar stations which permit monitoring of one's own artillery fire.

Most of these equipments were developed for the Bundeswehr, often with financial support from the Ministry of Defense. Thanks to the electronic dealers they now are available throughout the world.

But not only the Near East is interested in precision "made in Germany," many African countries also buy from the West-German electronics dealers. Thus Libyan Chief of State Muammar el Quadhafi has, just as has Syria, bought up his tank equipment in the Federal Republic--for export purposes it was declared as telecommunications equipment.

Good customers are the Latin American countries which place single orders to the tune of DM 25 Million. The Indonesians are interested in German "know-how" just as are several countries on the Southeast-Asian mainland. "The poorest countries spend most of the money for these things," reports an insider. At the Hamburg PK purchasers can even try out things: visitors from Libya or Indonesia learn the proper use of electronic gear in private training facilities.

It is astonishing that the Japanese have so far not entered this profitable competition. West German experts speculate that quantities appear too small to produce satisfactory profits. And since the British and the Americans control their high-tech exports quite strictly, the Germans practically dominate this business.

It is no wonder that more and more "clever" entrepreneurs dream of "fast bucks" through electronics.

The Munich "Schwenke Elektronik" offers the JAI 772--a gun-sighting system for battle tanks. It makes it possible "to receive and process data from almost all laser range-finders. In addition, a special infrared camera can be supplied, which can be used with the JAI-772 system to achieve specially high accuracy in target recognition."

The "H. P. Marketing and Consulting" company in Benstaben near Luebeck offers night-vision glasses which permit "laying or retrieving of mines, shooting with pistols or machine guns or flying of helicopters," also in darkness. Its manager Hans-Peter Wuest works together with the Bavarian arms manufacturer Messerschmitt-Boelkow-Blohm and the rifle producer Heckler and Koch. His equipment is sold as far as South Korea.

The "Glasco GmbH" company in Bad Oeynhausen obtained a contract for "equipping of three airborne battalions" in Saudi Arabia. The "Infrared Technology GmbH" (IRT) in Stuttgart offers special glasses as "first-class equipment for the precision shot," which can be "supplied for all weapons types." The only restriction is: Model Z can in the Federal Republic be supplied only to government agencies or with government authorization." In the meantime the Syrian elite troops have been equipped with these devices.

"Target simulation systems" are also being sold by the Dortmund company "Capito and Assenmacher" which otherwise is engaged in steel and pipe line construction.

Business is conducted in great secrecy.

Catalogs of the Hamburg PK are individually numbered and the number must be stated with each order. Documentation from other companies is only available if the requestor is known to the dealer or if references can be given.

The price list of PK is marked "confidential." A secrecy agreement is also required by the Austrian tank manufacturer "Steyr-Daimler-Puch AG" for the proposal drawings of an armored battle personnel carrier and of the personnel carrier G 127, which it is attempting to sell through the German electronics dealers.

Every page of the Puch documentation specifically states: "Documentation, drawings, attachments and other descriptions are for personal custody of the recipient and remain exclusive property of the Steyr-Daimler-Puch AG;... they must not be copied, duplicated, or communicated or made accessible to third persons. Unauthorized use will be prosecuted under the law." Everybody knows everybody in the trade and they all have names of contact persons and potential customers ready. An informant, who still is deeply involved in all of this, says, that "it is like a family clan, if a stranger appears, all the blinds are immediately drawn."

All this secrecy is of prime importance for the companies. An indiscreet tip to a government agency or to the media may destroy million dollar deals. In addition the job is dangerous.

One dealer, who once was regarded as Germany's "bug king," probably paid with his life for dealing in the gray area between governments, military and secret services. The then 32-year-old Hamburg business man Erwin Reichenberger, as owner of the "Micro Electronic GmbH & Co KG," a predecessor of Joachim Creutzmann, disappeared in April 1976 somewhere between London and the Near East. To this day it is not clear whether the Syrian secret service mistrusted him, or whether the Iraquis suspected a double game and eliminated him.

The business community was in no way interested in clarification of the mysterious disappearance. It had for some time been disturbed by the fact that the Hamburg recent millionaire got rid of his bugs to citizens of the Federal Republic and thus attracted the attention of the public prosecutor.

One just does not do such things. Keeping a low profile is the law of the dealers. "We are not crazy to make applications for export licenses at the Federal Office for Trade and Industry at Eschborn," says one of the dealers, "this only attracts attention."

So far the camouflage has worked; after the spectacular disappearance of Reichenberger little news has been spread by the military electronics specialists. And the customs people are rarely able to detect illegally declared wooden boxes or containers, which are shipped into the whole world, usually via air freight, but also by ship or truck.

For imports "we look into the boxes every once in a while" says a leading Hamburg customs official, "but for exports rarely." Intensive controls could endanger imports and the functioning of the German economy.

In the SPIEGEL GESPRAECH (29/1985) the current president of the Office for Protection of the Constitution and designated Chief of the Federal News Service Heribert Hellenbroich conceded: "Because of the massive volume of freight traffic, the customs office is unable to open every box. Naturally all items are falsely declared, the customs papers are plainly forged."

Often things also work without forgery. Shipments are regularly accompanied by a valid certificate of origin. This is issued by the local chamber of commerce which has not seen the goods. The customs office, responsible for issuance of the export permit, is otten satisfied with a look at the forms only.

Here the officers may easily miss a thing or two. In the required list of contents of a shipment, the packing list, there may, after an endless list of mini-cameras, UHF receivers, and mini-transmitters, appear a few "binocular night blasses" or a few laser instruments with an innocuous type designation.

It also is popular to designate hot items as laboratory equipment or to list only harmless descriptions of individual components. More expensive, and therefore suitable only for large shipments, is the detour over a NATO or exotic country, which is not covered by export regulations for military materiel. In this case the shipper purchases a legal end-use certificate from a higher official. With this paper he then can request an export license in Eschborn, the equipment leaves the Federal Republic legally, and is then routed from the alleged receiving country to the true destination. Naturally all shippers solemnly declare that they would never use such tricks, and that they operate completely correctly. But others...

"I know for sure that there are enough black sheep in our business" admits Micro-Electronic's chief Creutzmann, who naturally "generally views such illegal business activities with detachment." He too sells thermal imaging devices, infrared glasses, and other equipments which he obtains from Siemens, AEG-Telefunken, and Philips.

In sales discussions such companies assure him of sole marketing rights for certain regions, similar to the PK-Kluever arrangement with Philips for the Near East. Creutzmann says: "They gladly cooperate in regions where they are not too well established." The large companies apparently appreciate that the small ones do not have to be so considerate. Creutzmann again: "Our means to sell something are just a bit more aggressive.

Because of such methods, the Federal Republic has moved into the top group of weapons exporters. From 1972 to 1980, still during times of the socio-liberal coalition, German armament exports have increased ten-fold. And when the Saudis, at the beginning of the 1980's, showed interest in the Leopard 2, the Helmut Schmidt cabinet passed new "Political Principles for Export of Military Weapons and other Defense Materiel."

Until that time it was prohibited to export defense materiel into so-called zones of tension--this in itself is a vague concept. The general prohibition was softened in the new regulations by a definition even more difficult to understand: Now "vital interests" of the Federal Republic determine export approval.

In the meantime 72 countries, two-thirds of all developing countries, receive German war materiel. Forty-three of these were involved in military disputes between 1945 and 1982. The German G-3 assault rifle made by Heckler and Koch is used in 49 armies, often both sides shoot at each other with the same German top-brand weapon, as the Iraquis and Iranians do in the Gulf War.

The flourishing business with guns, cannons, tanks, aircraft and warships also provides profits for the electronics business. It also uses the fact to advantage, that sale of military high technology to developing countries is supervised more strictly in the United States, Great Britain and other European community countries.

The mobile short-wave transmitters of the US company LMR in Kansas City found their way to Syria via the PK company. The automatic direction finder systems ADFS-210 and ADFS-927, which are most suitable for naval operations, are not allowed to be shipped by the manufacturer "Ocean Applied Research Corporation" in San Diego, CA, to the Near East or to Argentina, but they are permitted to go to Germany, From there they are shipped over well-established routes all over the world.

A communications system which had been developed by the Scandinavian "Delta" company for the Norwegian and Swedish armies is being offered by Creutzmann, who is also printing sales material jointly with the weapons marketing firm "Merex AG" in Koenigswinter, well known since the 1960's.

Kluever has diverse equipment of the British-American "SAS Group of Companies" in his program, which are permitted to be exported into the Federal Republic, but not from there into various critical areas, because of lack of "vital interests" of the government.

Anyway, the interests of the Federal Republic are not the interests of the electronics distributors. While the company trio Kranz-Micro-Merex bid on providing security for the Lebanese Minister-President in Beirut, Kranz specialists explained on-site the security provisions of the Frankfurt airport and of the Bibles atomic powerplant, which they had also installed.

Such security installations are of course strictly secret.

7994
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TECHNOLOGY TRANSFER

ARTICLE DISCUSSES TECHNOLOGY DIVERSIONS THROUGH SWITZERLAND

Zurich DIE WELTWOCHE in German 8 Aug 85 p 9

/Article by Andreas Flutsch: "Love and Kisses from a Swiss Letter Box. Our Country Serves as a Turntable in the Lucrative Business of Smuggling Western Technology to the East Block"/

> /Text/ According to the CIA, about 20,000 Soviet agents are smugglers and spies who are assigned to deliver the latest Western technology to the East. The trick is always the same: Through a business network of many branches, the "hot merchandise" is exported legally from the United States and arrives illegally in the East after crisscrossing shipments between Amsterdam and Zurich. The Swiss letter-box companies often serve as the "turntable." The authorities are ineffective to a large degree, and, unfortunately, the industries dependent on imports are adversely affected.

Nine computer disks in shipping crates had traveled without a seeming goal through half of Europe before they were detained at the airport of Wien-Schwechat last February 18 by order of the Austrian finance minister. Lawyers of the producer Control Data rushed from the United States to bring court action to prohibit further shipment of the computer ware.

After prolonged debates between Austrian and American authorities, the parties recessed behind closed doors, and the court finally decided to keep the disks behind lock and key. (Each computer disk can store as much information as is contained in a complete set of the Encyclopedia Britannica.)

For once the lucrative smuggling business of high-tech from the blessed land of capitalism to the "Land of Evil" did not go according to plan. The Institute of Factory Automation in Bulgaria's capital Sofia, which was listed as consignee in the shipping documents, must now continue its research without the highly valuable information storage media. The U.S. authorities realized that the 500 members of the institute were more adept at trying to obtain the latest technology from the West than at scientific accomplishments.

The Brussels electronic company "Noron" ostensibly had no knowledge of this side trip into Austria--as a springboard into the East block thirsting for Western technology. Even before the end of the week, officials from Noron emphasized in the U.S. business publication INTERNATIONAL BUSINESS WEEK that the original customer, the Amsterdam exporter "Grandia Projectservice," had instructed the computer disks to be delivered through the neutral country of Switzerland to a company called Tacoimpex, located in Guibiasco.

However, the merchandise never arrived at Tacoimpex. The manager at Taco, Mr. Luigi Coizzi, claimed it was all "a mistake" as reported in the U.S. publication. The computer disks should have been delivered to HongKong and a shipment of lighting fixtures to Sofia instead. This "statement of fact" caused hilarious laughter among the U.S. agents. It did not matter to Mr. Coizzi. An official of the Swiss Office of Foreign Commerce (BAWI) complained, "We are not allowed to act against such businesses as long as Switzerland serves as transit point. If the goods are not imported, our hands are tied." The Swiss smugglers of high tech avoid importing at all costs.

The trick is crude though ingenious: Along the criss-cross route to the East, the hot merchandise reaches Switzerland but as duty-free storage. Legally the computer disks, although they have reached Switzerland in transit, have not touched Swiss soil. The merchandise has remained within the transporting medium in duty-free storage and consequently was never brought into Switzerland. A Swiss EVD /Swiss National Economy Department/ official commented, "When there was no import, there exists no export control." It is that simple! Taco's manager Coizzi can calmly throw away the warnings the U.S. Department of Commerce has given him that his firm has been placed on the "black list" and can no longer receive "strategic" merchandise. Coizzi feels safe from the Americans.

Fear of Boycott by Swiss Industry Dependent on Import. This is so even though Switzerland cooperates completely with the U.S. and NATO allies in the technology boycott against East Europe. This is in spite of Switzerland's claim that it is a neutral small power. But fear, specifically the fear of the United States extending the boycott against Swiss industries dependent on high-tech imports causes flexibility and compliance.

Thus, it happens that Switzerland, although not a member of the Western military alliance, has adopted as law almost unchanged one of the embargo lists (known as the Cocom Agreement) drawn up by the United States and its NATO partners. However, there is a way out! A regulation concerning goods exports stipulates that 139 product groups cannot be exported to a Communist country. For this purpose they would first have to be imported into Swiss Customs territory. It becomes clear why "Techno-Cheats," of Coizzi's keep on trying to participate in the technology smuggling business. According to U.S. reports, the Soviets pay up to 400 percent above list price for highly desirable high-tech merchandise. In a few cases it has been said that the price was even ten times that of the list price.

The reaction by the United States was forthcoming. Since the beginning of this year, Switzerland, together with other neutral European countries like Sweden, Austria, Finland, and Liechtenstein, have appeared on a "gray list," christened

by the United States as a harmless "list of less favored countries." This list may have dire consequences for our top industries. In contrast to the Cocom nations whose requests for export of technological goods are granted by the U.S. Department of Commerce, the Pentagon can interfere at any time and veto requests by nations on the "grey list." Edward Burger, in charge of export control in the BAWI clarifies this by stating, "This means that we are being observed more closely. Our industry which adheres to the official and more difficult path of obtaining permits must suffer due to a few crooks." For example, the Basel transport company Frank AG or the Hasler subsidiary Favag SA company in Neuenburg appeared on the U.S. grey list because several of their employees were recruited to engage in smuggling high-tech goods. It was only after tiresome negotiations that the companies succeeded in having the delivery boycott lifted. Because of such difficulties Austria, with massive pressure from Washington, has decided to put teeth into its foreign trade laws by the end of this year. A significant, and possibly explosive issue is the existence of a brand new secret list which has been assembled by the Austrian government and is supposed to be kept in a government vault.

As the Viennese periodical WOCHENPRESSE recently revealed, the list states the following about the persons and companies enumerated on it: "It is advisable to exercise special caution with existing or planned contacts with domestic and foreign companies which are on the list." This would be especially valid for business contacts of the nationalized companies, whose non-adherence to this order would result in heavy losses on the Western markets. The list is like a "Who's Who" of letter-box companies and international high-tech crooks. If Austria has named 49 persons and companies. Switzerland should have 30 nominations.

A Local Boss From Zug With 119 Directorships

This represents only the tip of the iceberg of letter-box companies and camouflaged addresses. As an example, the trustee Albert Franz Kessler from Thalwil near Zurich, got on the black list of our neighbors /Austria/ and the Americans, because he had tried 3 years ago to spirit highly sensitive measuring devices out of the United States. The U.S. agents got him off the plane shortly before departure, together with his "suitcase containing $124,000 worth of expensive merchandise," and kept him in jail before trial for half a year. According to Kessler he received a sentence of "half a year in jail and a $50,000 fine." The U.S. authorities had a completely different story: chips and semiconductors for navigational systems for rockets and tracking systems for satellites. According to his own statements Kessler was jetted to the United States for the shopping tour of techno-products by order of a firm from Liechtenstein, another paradise for letter-box firms. Was he worried if the merchandise remained there /Liechtenstein/? Kessler said "that it made no difference to him." Today he swears up and down that "he is no longer in business." It is only peculiar that he is in charge of a web of firms, which are particularly ideal for "the business." (In 1982, he was only on the board of a firm under trustee's management.) At first, he moved the companies which had come under his charge in 1984 to the still unobtrusive part of Switzerland, the Innerschweiz /the interior of Switzerland/. There was, for example, the commerce- transportation-, and freight company, Intertrademetals AG based in Altdorf, formerly Zug, and then Fluelen

Elaca AG, whose business is merchandise of all kinds, was moved from Basel to Erstfeld. Also the Transair Cargo AG, formerly Lucerne, now at Hohenstrasse 31 in Fluelen. It is now called TM Air Cargo AG. Another Kessler-firm was moved from Zug to the Urschweiz, namely Computer Control System AG, etc. It was a kind of children's game: While the names of firms which are known to U.S. agents disappear, others are revived unsuspectedly or are newly established. It is true to Kessler's motto: "Whoever is on the black list can, in spite of it, obtain top technology by advancing another company in its place."

Prominent on the Austrian list are often principal letter-box trustees like Max Peterhans, a manager from Zug. He is 17th from the top of the biggest collectors of seats on boards of directors. Peterhans controls 119 firms from his central office at Grienbachstrasse 11 in Zug. He also manages Impana AG which has been listed by the Austrians but put out of business, and Optron AG in Zug, which in the meantime no longer exists. Peterhans was also the first landlord of Zapata AG at the Geuensee lake near Lucerne, which sent the unlucky ship "Lucona" on her last voyage and thereby uncovered the whole scandal about Udo Proksch, the owner of the Vienna bakery Demel. The same person, Proksch, appears several times on the Austrian secret list. Peterhans is also owner of Lylac AG in Unteraegeri, near Zug, which, according to Proksch's description, belongs almost completely to Demel.

The more secretly one operates in Zug, the more openhearted are the stooges in the aspiring El Dorado of camouflage addresses located in the town of Giubiasco (Tessin). To be more exact, the front Beatrice Bernasconi behind whom Coizzi hides. The well known knitting pattern has also been applied here: a foreigner looks for a native or natives to provide a display sign for authorities and customers. In the former case, the secretary Bernasconi must occupy important posts in Coizzi's companies. She is on the board of Fimelec SA and FMC Impex SA. The unsuccessful deal of Tacoimpex involving the nine computer disks also ran through the offices of FMX Impex. Tacoimpex, headquartered in the village of Barbengo (Tessin), although not occupying any office space, nevertheless has a Swiss board of directors. Mrs. Bernasconi voluntarily admits that several other pure "mail box firms" are headquartered in the offices of FMC Impex: Newelectronic SA, Fimec, Incomat, SAT, and Dasyl AG. The commanding personality of the shadow empire in Tessin, maintains Mrs. Bernasconi, is Luigi Coizzi. "Ask him who manages the companies! It is he!"

Geneva Diamond Dealer is Advisor to Emperor Bokassa

The name of the Lebanese citizen Ali Hijazi has also been added to the list of techno-smugglers. The 50-year old Shiite has been in the jewelry business in Geneva since 1979. He also resides in Beirut and Tripoli. At one time this dealer in precious stones served as economics advisor to the Emperor of Central Africa, who appointed him /Hijazi/ president of Central African Airways. After Bokassi was toppled, the airline was taken over by Libya. Together with a Hercules machine, which became his disaster. "Everything is legal," Hijazi still claims today. American sources tell a different story: Hijazi is supposed to have obtained the machine through two front companies in Luxemburg and, therefore, will remain on the black list indefinitely.

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